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PHILOSOPHY AND THE QUEST FOR PRIME INTEGRATIVES

W. PRESTON WARREN
Professor of Philosophy
Bucknell University

HIGHER education is in quest of prime integratives. The irresponsibility of dissevered intellectual and cultural lives has shown its special hazards; so much so, in fact, that "integration" already is a hackneyed term. The problem, even now, has not been adequately envisaged. Because we are creatures of our time with its intellectual fashions—growing out of social dialectics—we are afraid of notions like "first principles." Even such an Absolutist as Professor William Ernest Hocking wrote his philosophic credo in the unpretentious terms of "Some Second Principles."[1] Yet the alternative to integration effected through first principles is integration of the circumstantial, jig-saw type. And this is integration only in the casual, local sense.

The problem, which we find persisting, resists such local treatments, without due sense of principle—along with the correlative circumstance that first principles are hard to derive with sufficient validation. Chancellor Robert M. Hutchins, for example, was right in asserting that first or "highest principles" are our central need for general education. He was wrong in the arbitrary procedure with which he proposed to deal with the problem. Books rather than science were to be his principial sources. Functionally, we need both books and the hard-headed first-handedness of science. And we need something significantly more than an approach which simply takes cognizance of the fact that people have made definite claims of ultimate concepts and that some of these have had scant relevance or importance outside the special formulations in which they were proposed. Integrative principles must both square with areas of fact and give intelligible and, so far as possible, integral unity to perspective.

[1] G. P. Adams and W. P. Montague, eds., *Contemporary American Philosophy* (New York, 1930), I, *passim.*

Now science—and our age is frequently distinguished as an age of science—has not been self-evidently interested in first principles. It has set itself the modest task of building up piecemeal generalizations on the basis of sustained observation and of mathematically precise calculations. In this sense William James' dictum regarding metaphysics applies likewise to science, *i.e.*, that it is an "extraordinarily stubborn attempt to think consistently" or, at least, to think supportedly. Science has advanced, indeed, toward more inclusive generalizations until today we have the all-inclusive theory of Einstein, *i.e.*, all-inclusive for purely physical relations. There are scientists, certainly, who believe that science goes quite beyond purely physical and mechanical relations, but here, there is little doubt, we get into questions of philosophies of science.

What is important for our purpose, however, is that science, whether it abjures, or moves tentatively toward, first principles, does assume and imply principles. We are not interested here in all those postulates and undefined ideas which are sometimes characterized as first principles of science. Some of these might change without effecting any basic change in the character of science as such. Witness the shift to a more functional view of matter itself. We are accordingly interested only in those principles which are ingredient in the very nature of science. And we are using the notion of principles in the senses of organizational and interpretative principles rather than in the senses of postulates or of special laws.

What has become evident as the quintessence of science is not just a concern for facts—important as that was in the revolt from standard medieval modes of thought—but a sense of the relations of facts—a sense of "precise relations." Existence itself has been envisaged as conforming to the niceties of mathematical order.[2]

Professor Whitehead states this concern with relations somewhat less stringently when, in a paraphrasing statement, he writes that the "new tinge to modern minds is a vehement and passionate interest in the relations of general principles to irreducible and stubborn facts. All the world over and at all times there have been practical men, absorbed in 'irreducible and stubborn fact'; all the world over and at all times there have been men of philosophic tempera-

[2] Edward H. Cotton, ed., *Has Science Discovered God?* quoted in G. T. W. Patrick's *Introduction to Philosophy* (Cambridge, Mass., 1935), p. 166.

ment who have been absorbed in the meaning of general principles. It is this union of passionate interest in the detailed facts with equal devotion to abstract generalization which forms the [scientific] novelty of our present society."[3] It is this "balance of mind" which comprises what we have for several centuries called modern science. A sense of principle belongs therefore to the very fabric of science; it is by no means extraneous.

Two other characteristics of science, furthermore, seem relevant here. The first gives the impression that science is a quite self-contained frame of reference; the second, that it is organic to both art and philosophy—not to mention technology or even religion. The first is its operational character. President James B. Conant has phrased this aspect of science quite intelligibly. "Science," he says, "emerges from the other progressive activities of man to the extent that new concepts arise from experiments and observations, and the new concepts in turn lead to further experiments and observations. The case histories drawn from the last three hundred years show examples of fruitful and fruitless concepts. The texture of modern science is the result of the interweaving of the fruitful concepts."[4]

The relation of concepts to observations and experiments is a functional relation. Scientific concepts are susceptible, therefore, even to fundamental changes in the light of stubborn facts and of further concepts that interpret these facts more adequately. On the other hand, the facts which are taken into account are in every instance selected—through one's view of the problem—and the encompassing of all relevant considerations is an historical process. Scientific "truth" is not therefore simply discovered or determined by Galileo or Tycho Brahe, or by Darwin or John Broadus Watson. It is a progressive emergent. This is a principle ingredient in the functional character of science itself.

Now this process, secondly, is not the self-sufficient kind of thing it might seem to be. Science is organic to literature and art, on the one hand, and to philosophy and religion, on the other. Where, for example, do scientific ideas come from—and go to? Do the facts communicate them to the scientist? Can they be dug out of an array of data by sheer industry? Or do they come to men of

[3] A. N. Whitehead, *Science in the Modern World* (New York, 1948), p. 3.
[4] James B. Conant, *On Understanding Science* (New Haven, 1947), p. 24.

culture and envisagement by the process of considering the relationship of principles to each other and to concrete situations, with a very considerable readiness in imaginative envisagement? Both of these elements, *i.e.,* reflection on principles, their relations and relevance, and imaginative envisagement, are substantially supported in biographies of notable scientists. As Alfred North Whitehead said of modern atomism: "The notion of matter as atomic has a long history. Democritus and Lucretius will at once occur to your minds. . . . In the eighteenth century every well-educated man read Lucretius and entertained ideas about atoms. But John Dalton made them efficient in the stream of science; and in this function of efficiency atomicity was a new idea."[5]

Copernicus, from whom is dated the modern outlook of astronomy, went at his inquiry by direct consultation of the "ancients." Finding in Cicero that Hicetas "had thought the earth was moved," and discovering that "certain others had held the same opinion," he explained to Pope Paul III, "I myself also began to meditate on the mobility of the earth."[6]

It is not just basic or philosophical conceptions, however, that scientists derive from literature and other foci of culture. "We have to recognize," wrote Havelock Ellis, "that the true man of science is an artist. It was by his wonderful imagination . . . that Newton was constantly discovering new tracks and new processes in the region of the unknown. The extraordinary life work of Helmholtz . . . , scientifically precise as he was, had . . . an esthetic coloring. There is no such thing as an unimaginative scientific man. . . . Artistic ideas like that of the steam locomotive, the flying machine heavier than air, the telegraph, the telephone, and many others . . . were at the very moment of their being achieved elaborately shown to be 'impossible' by men who had been too hastily hoisted up to positions of 'scientific eminence.' "[7] Scientific imagination is fertilized by literature, art, and human associations, as well as by philosophy.

It is significant that Whitehead, in discussing the viewpoint of modern science, groups together Newton, Descartes, and Locke.[8]

[5] *Science in the Modern World,* p. 101.
[6] Copernicus, *De Revolutionibus,* quoted by E. A. Burtt in *Right Thinking* (New York, 1946), p. 371.
[7] Havelock Ellis, *The Dance of Life* (New York, 1933), pp. 72-73.
[8] *Science in the Modern World,* chap. III; *cf.* Whitehead, *Process and Reality* (New York, 1929), p. ix.

Locke, although a doctor of medicine, is seldom regarded as a scientist. Of the three, Descartes comes closest to combining science and philosophy, but will presumably always have clearest status as a philosopher. Newton may have been somewhat of a theologian in addition to being an epochal scientist, but he was certainly not significantly a philosopher. Yet his *Scholium* is the expression of one of the two great European cosmologies.[9] The fact is that science, literature, and philosophy are parts of a single fabric and are thus organic to each other. None of them is self-sufficient. Whether each presupposes a substantially organic notion of existence, or the contrary, is another question.

It ought, of course, to be a truism that

> every scientist and scholar has some sort of philosophy—whether his assumptions in this respect are explicit or implicit, whether his position is adopted advisedly, or whether, as Molière's hero, he talks prose without being aware of it. Likewise, the total philosophic-scientific mentality of the various culture periods studied have invariably involved some sort of "first principles" basic to the complex "superstructure" of the numerous scientific and philosophical theories of the time. . . . Without such a framework no systematization, classification, or even apprehension of the facts would have been possible. Clearly, some such first principles must be assumed if the more detailed theories in various fields are to be coherently organized.[10]

We have in science, therefore, entailments of principles. Yet the first principles of science are not the first principles of the relations of science with art, literature, philosophy, and religion, unless science, as such, implicitly involves these fields and does so quite completely. We shall not analyze literature or art to determine whether there are similar intimations of first principles in the "humanities." Suffice it to indicate that we have in these "disciplines" an expression of interest in a variety of kinds of experience and achievement, and that these achievements and experiences are more diverse by much than the types of experience which science treats as normative. The interests of the humanities are typically intensive rather

[9] A. N. Whitehead, *Process and Reality*, pp. 142 ff.
[10] P. A. Sorokin, *Social and Cultural Dynamics* (New York, 1937), II, 181-182.

than extensive, expressed by such terms as feeling, insight, design, imagination, aspirations, and by the whole gamut of aesthetic categories ranging from the sense of beauty and of the sublime and the tragic to the comic, the picturesque, and the novel. The whole notion of the satisfactions of life tends to involve an aesthetic component without which they would scarcely have meaning.

The aesthetic element is undoubtedly significant in science, as we have indicated. It is indubitably characteristic of mathematics.[11] At the same time the determination of science to read out whatever is purely individual and whatever is subjective produces an impoverished version of reality.[12] "The literature of the nineteenth century," to quote Whitehead, "is a witness of a discord between the aesthetic intuitions of mankind and the mechanism of science . . . the literature of the romantic movement, just as much as Berkeley's philosophically idealist movement, one hundred years earlier, refused to be confined within the materialistic concepts of the orthodox scientific theory," though we find in the twentieth century "a movement in science itself to reorganize its concepts driven by its own intrinsic development."[13] The dimensions of man's inner life and his expressions and experiences of value remain the special focus of literature, of the plastic arts, and, we should add, of religion.

The subjectivities and the relativities of these perspectives involve problems and perhaps predicaments which need not concern us specifically here. By viewing literature and other arts as "humanities," however, we have a test which seems fundamental to all apprehensions of value. "Man is the measure of all things"[14] from the standpoint not of truth but of value. Attempts to conceive of value in the world outside of man are attempts to envisage existence in the light of man's emergence in its framework or schema.

[11] J. W. N. Sullivan, *The Limitations of Science* (New York, 1949), pp. 162-172.

[12] Iredell Jenkins, "The Concept of an Impoverished Reality," *Journal of Philosophy*, XXXIX (1942), pp. 533-547; *cf.* Whitehead, *Science in the Modern World*, p. 56.

[13] *Science in the Modern World*, pp. 88-89.

[14] Dictum of the famous sophist Protagoras. The primary English source for this dictum is Zeller's *Outlines of the History of Greek Philosophy* (13th edition revised by Nestle and translated by Palmer), p. 83. T. V. Smith's *Philosophers Speak for Themselves* (Chicago, 1934) contains this and two other "snatches" of Protagoras' educational philosophy as given by Zeller. A distinctive picture of Protagoras himself is given in Plato's dialogue entitled *Protagoras*.

This undertaking is a quite justifiable one in spite of the compass of those who, from fear of a "pathetic fallacy,"[15] want to treat existence and value as quite independent variables. Incisive thinkers recognize such a consequence as a dichotomy which presents a more fundamental difficulty than that of the projection of feelings into the objective order. The conclusion that one's paramount interests have no basis in fact or in realistic process is comparable in human significance to Caesar's discovery that even Brutus had betrayed him. That those who stress the naturalness of man want to treat the experiences of value out of relation to the nature of which human nature is a part seems not quite consistent, to say the very least. Man ought to be some index to the place of value in the world.

Similarly man himself ought to be a measure of aesthetic values. Experiences of appreciation and enjoyment and of constructive expression and envisagement may be viewed as self-sufficient, *i.e.*, values in themselves, or, as Dewey calls them, ends-in-view. Enjoyments simply for their own sake are assuredly aesthetic values. But do they sustain themselves as enjoyments as they function in wider, varying contexts? Do they become lesser or greater enjoyments? Or do they cease to be enjoyments at all in broadening contexts? This is the test of man as the measure. Man lives in many functions and in varied relations. Some "things" sustain and consolidate themselves in these functions and relations. Some of these things are thoughts, imaginings, affections, aspirations. Some do not sustain or consolidate themselves. They do not, in other words, validate themselves as the values they were thought to be. And value, independent of any notion of validation, is raw and chaotic. It is interesting to note that even the more subjective and relativistic aestheticians recognize the need for organization and criticism of values, with consideration of enduring and dependable values.

We would seem, therefore, in the arts likewise, even in so provisional a treatment as this one, to point to a principle—a principle of value. Man is the index. In this view, ethics, aesthetics, and at least some of the religious teachings of Jesus seem to converge. Is Santayana then right when he states that from his viewpoint, as an

[15] R. B. Perry, *General Theory of Value* (New York, 1926), pp. 56-59.

aesthete, all values are moral values?[16] If so, we have made a substantial step forward.

In ethics we have come unequivocally to philosophy. In contemporary philosophy the case for first principles is not much clearer than it is in the humanities and the sciences. True, the concept of perspective is used by some, with the notion that philosophy should combine the insight of art with the outlook of science; that philosophical perspective ought to contain depth as well as breadth and factual relevance. Yet the notion of principle which would give intellectual perspective its meaning is not clearly dealt with—again, presumably because of the cautions of the modern mind. The spirit of modernity, with the approach by way of direct data of nature rather than by that of metaphysics, makes first principles derivative and accordingly recessive. One of the nearer approaches to this issue, however, is that of Professor Brand Blanshard in his chapter on the "Opportunity of Philosophy" in the American Philosophical Association's study of *Philosophy in American Education*. Many educators, Professor Blanchard says, are proposing either to achieve intellectual and cultural unity

> artificially by manipulating the units into patterns—a course we have seen to be insufficient—or else to depend on certain subjects, conceived as peculiarly central, to draw the others together. Of these, apart from philosophy, three are commonly mentioned—history, literature, and natural science. They are all obviously indispensable in any liberal education, and yet each, as a unifying agency, labors under special handicaps. History integrates, but along a temporal line; and though this line is of great value in literature and politics, it is of comparatively small significance in the field of science. Literature integrates; but literature as a college study leaves out most of the "literature of knowledge" in order to deal better with the "literature of power." Science integrates; but it is limited in the opposite way. Though it is unchallenged in the world of facts, it is silent or confused when confronted with the realm of values; nor does any of the sciences undertake the scrutiny of its own ultimate assumptions or the synthesis of its results with those of other inquiries.
>
> There remains philosophy. The reader may well be critical here, for philosophers are not exempt from the temptation felt by others to engage in special pleading

[16] *Contemporary American Philosophy*, I, 256.

> where their own affections are involved. But neither should misguided modesty lead them to hide their light under a bushel. And the truth seems to be that, as an agent for unifying knowledge, philosophy is in a unique position. For it is really not so much a subject alongside other subjects as a kind of reflective activity that may inform them all, and it is only through such activity that order and perspective in knowledge are to be achieved. Philosophy does seem to be free of the special handicaps that rest on neighboring disciplines. The relations that it studies spring from the nature of the things related; its interweavings are done on the loom of logic not, like those of history, on the loom of time; and to the mind in search of understanding, patterns so woven are always the most deeply satisfying. Unlike literature, it moves with equal ease in the realms of value and of scientific fact. Unlike any natural science, it pushes back the assumptions of all the sciences to a common meeting point in a single logic and theory of knowledge; and it finds its most fascinating problems in putting the conclusions of these sciences together into a coherent view of the world. In theory at least it is difficult to resist the conclusion repeatedly pressed upon us by academic leaders outside the profession that in the vast sprawling diversity of contemporary knowledge philosophy supplies the unifying agent *par excellence*.[17]

Here we have the values of philosophy as a distinctive integrative agent. Yet we do not have integrative principles as such—except the principle of topical and therefore meaningful integration. Are these integrative values of philosophy largely still the implicit sort of thing we found in referring to the *interrelations* of science, literature, and philosophy? That, as Blanshard says, "physics burgeons into metaphysics," and "poetry into psychology and aesthetics," indicates, as he pointed out, that "to the reflective mind 'there are no islands any more.' " "When any subject is reflected on with the view to understanding, it sends out tendrils to other facts, and since these reciprocate they all tend to be woven into one firm extended fabric."[18] But are there no clear principles or unifying

[17] Brand Blanshard, *Philosophy in American Education* (New York, 1945), pp. 93-94.

[18] "Education as Philosophy," *Swarthmore College Bulletin*, XLII (July 1945), as adapted from *Philosophy in American Education*, p. 93.

concepts which would make these and other relations intelligible and functional?

It is possible, in fact, to make a still closer approach. We have already mentioned ethics. In ethics, with its study of the questions of good and bad, of right and wrong, of obligation and privilege, we are able to discern some rather clear first principles. Ethics is, in point of fact, the formulation of the sense of principle regarding human goods, conduct, and relations. There are indeed different theories of ethics: hedonistic, eudaemonistic, legalistic, instrumentalist, and evolutionary. The interesting point, and one which is not always appreciated, is that most of these views are not basically discordant. Some, indeed, are much more limited than others. The coarser kinds of hedonism are certainly not compatible with the clearer notions of self-realization. But it is hard to envisage the cruder variants of pleasure ethics as other than tangental. The more discriminating hedonisms are not unassimilable by either eudaemonism or the more formalistic kinds of ethics. Even utter egoism can be enlightened and considerate, though the motive forces of egoism may be highly overrated. Part of the functional value of egoism, in fact, lies in the circumstance that human interests are not actually exclusive. The larger "concrete" self, as George Herbert Palmer and many others have demonstrated, is social. Egoism therefore ceases to be egoism when seen in full perspective and becomes what C. D. Broad has called "Self-referential altruism."[19] Such a self-reference, moreover, is ethical economy. There ought to be greater efficiency, and much less wastage, in an ethic which, without losing universality of outlook, finds the prime focus of its principles in self and home.

The cardinal point is that ethics, conceive it as we may, stands for the goods of life and for the principles of their wisest actualization. And the really ethical point of view is one in which the goods of anyone are seen as equalling the same goods of any other. The utter fairness of this view shows its moral caliber. Immanuel Kant stated a first principle of ethics when he affirmed as an element of moral law that one ought always to treat everyone, including himself, as an end and not as a means only. But it is not always possible to treat everyone as an end. There are plenty of circumstances in which this can not be done. The English Utili-

[19] Cambridge University Class Lectures (Spring, 1935).

tarians formulated a more makeshift principle suited to such circumstances, namely, that of the greatest good of the greatest number. But the spirit which informed that principle was the Kantian spirit that one should, if possible, treat everyone as an end and never solely as a means. The alternative, in instances in which the Kantian principle can not be fulfilled, is that of the good of the greatest number. The Utilitarian principle was accordingly a second principle designed for the exceptional case. It assumed the universal rule.

From the integrative standpoint we could view this principle of the end-value of persons in its relevance to politics and business, or, more conceptually, to political science and economics. These arenas may be approached from viewpoints of what has been done and is being done, or they may be approached in terms of job analysis, *i.e.*, what is to be done. There is much to be said for the ethical principle of the end-value of individuals in what has been and is being done in political science, government, economic processes, and theory. But, from the standpoint of the job to be done, ignoring or violating this principle spells continued catastrophes, such as those in Czechoslovakia and similarly circumstanced nations.

This principle is therefore one of integration. It is, in fact, a moral extension of the principle we noted in the humanities, that of man as the measure of values. This principle, furthermore, has an extension in religious philosophy. It becomes there a notion of cosmic signification. We noted before that the use of man as an index was a thoroughly permissible process since man is an extension of, and not something quite different from, nature. Religions, by and large, bespeak the faith that, as Dean H. A. Bosley says, "human values are neither optional nor arbitrary but are organic to the universe." In particular, "the great classic concepts, Truth, Beauty, Goodness, and Love . . . are not simply human constructions but indicate certain actual and possible relations between man and the rest of nature. . . . They are human constructions in so far as they represent our groping efforts to clarify the meaning of life, actual and potential. Yet they are more, much more, than human creations, for they are attempts to describe a relationship which does exist in some measure and may through wise choices and purposive living exist in greater measure." Human

values, especially the great classic values, are "ways of describing certain types of adjustment, certain modes of relationship, which we have discovered in part, and which invite further exploration and experimentation."[20]

Religion is man's response to his consciousness that his values are not unsupported but are cosmic in character. Everyone implicitly, and often explicitly, recognizes something of this principle. The apparent discovery that one's values are unsupported is, in fact, one of the most jolting and calamitous events of men's lives.[21]

In a refreshing address on "Metaphysical Vision," Professor Herbert Schneider points out that the branch of philosophy known as metaphysics is engaged in the binocular function of correlating scientific knowledge and experiences of values. At the same time, this correlation is not thought to have any metaphysical meaning but simply to function piecemeal in "practical judgment, critical ability, and poetic imagination." It offers "no insight into reality as such."[22] It is but an imaginative superimposition with a very considerable functional significance.

Religious faith in the cosmic basis of value and in the cosmic functions of life is more defensible. Such a faith is supported by the principle of continuity. This principle has been quite widely expressed. Leibniz is perhaps its classic exponent. It is sufficient here, however, to set forth what is thought to be an instance of discontinuity in history. Morris R. Cohen and I. E. Drabkin thus phrase this instance:

> The notion that natural science began in the seventeenth century with Bacon, Galileo, and Descartes, or perhaps in the sixteenth with Copernicus, and that the Greeks were mere speculators and the medieval thinkers all sunk in theology and superstition is not merely an established popular error; it has become a basic dogma of modernistic philosophy and is even shared by some professional historians. This error is largely supported by the prevailing type of specialized education, which trains students of nature to look at things from the point of view of current conceptions and does not sufficiently equip

[20] "The Intellectual's Crisis in Religion," *Association of American Colleges Bulletin* (March, 1948); reprinted in *Main Issues Confronting Christendom* (New York, 1948) as "Can the Blind Lead the Blind?"

[21] W. P. Warren, *Masaryk's Democracy* (Chapel Hill, 1941), pp. 92, 93.

[22] *Proceedings and Addresses of the American Philosophical Association, 1948-1949,* pp. 399-411.

> them with the philological or historical methods to investigate how the world appeared to man at other times. On the other hand, historians trained in the humanistic tradition often fail to discriminate justly between genuine science and folklore. In any case, the scientist's interest in the nature of things and the historian's interest in the development of man's critical knowledge are all too seldom united.[22]

Professor Cohen had earlier explained, in a paper on John Dewey's philosophy, this misconception of the relation between ancient and modern science. Dewey had maintained, according to Cohen, that "ancient science was demonstrative, while the life blood of modern science is discovery."

> Now [said Cohen] I submit that this is neither historically true nor can it ever be so. Mathematics, the most demonstrative of the sciences, grows by successive discoveries, and has proved the most fruitful source of even physical discoveries. For mathematical and logical relations are as objective matters to be investigated as are the velocities of the stars. Nor is it true, as is asserted by popular historians and scientists when away from their laboratories on a philosophical picnic, that the Greeks did not resort to experiment. The work of Hippocrates, Archimedes, Hero, Hipparchus, and Eratosthenes amply indicates the contrary. Even Pythagoras had to experiment to discover the laws of musical harmony. It required experiment to determine the effects of diet, exercise, and climate on health and disease. It required refined measurement (which is still essential for exact experiment) to decide the choice between rival theories of astronomy such as those of epicycles and excentric motion, to determine the precession of the equinoxes, or the actual length of a degree of latitude on our earth. Moreover, an actual reading of the work of Copernicus, Kepler, Galileo, and Newton fails to justify the popular legend that the science of the sixteenth and seventeenth centuries was revolutionary in its attitude to previous science. It is a myth to suppose that modern science arose when it suddenly occurred to a few men to discard the authority of Aristotle and to examine nature for themselves. . . . If we read Copernicus' own work we see that he only revived the Pythagorean

[22] Morris R. Cohen and I. E. Drabkin, eds., *Source Book in Greek Science* (New York, 1948), p. vii.

> astronomy, that he accepted the method of Ptolemy, which is after all still the method of mathematical physics, and that his so-called revolution was after all only a simplification of Ptolemy by reducing the number of epicycles. . . . To Galileo and Newton, Euclid and the other Greek mathematicians were the very basis of all physical science. It is amazing how relatively few mechanical experiments all these men made and how much they were influenced by the idea that the book of nature was written in mathematical terms so that the object of science was to find out this simple underlying mathematical pattern.
>
> Modern science [moreover] has not abandoned the basic Hellenic idea of a constant order, law, or relation, in the flux of phenomena, nor has it adopted the cult of the limitless infinite, nor the even more recent illusion of function without substance, the grin without the cat. And it is simply not true that "Change rather than fixity is now the meaning of reality or energy of being." According to the principle of relativity there is just as much rest and permanence in the world as there is motion and change, since neither set of categories has any physical meaning apart from the other. And even in the older physics, potential energy, the energy of position, is as real as kinetic energy.[24]

The point of preëminent moment in the Cohen and Drabkin discussion is that not only is the development of science continuous —and illustrative of the continuity principle—but that existence looms as continuous in the scientific envisagement of it. Even the recent problem of the granular character of periodic motion[25] and the issue of the conflict in the conceptions of wave and quantum mechanics have not been thought of as more than provisional.

To think, then, that value and experience belong to a realm of ideality or fictions, independent of the structure and detail of existence, is to hold that continuity does not apply in this area. What Santayana said of Aristotle is far more intelligible. "With Aristotle," he wrote, "the conception of human life is perfectly sound, for with him everything ideal has a natural basis and every-

[24] Morris Cohen, "Some Difficulties in Dewey's Anthropocentric Naturalism," *Philosophical Review,* XLIX (April, 1940), pp. 209-211. A paper read in a Symposium of the American Philosophical Association, December, 1939.

[25] R. A. Millikan, *Evolution in Science and Religion* (New Haven, 1928), p. 27.

thing natural an ideal fulfilment."[26] From this standpoint, experience, value, and existence may be different poles or foci, and there is little doubt that they are. But none of them is an unreality, and they are integral to each other.

Whitehead, indeed, extends this principle throughout existence, finding in the ultimate units of existence a pole approximating experience, in that each reacts to, and takes account of, other entities in accordance with eternal principles and value processes. Much of his philosophy might, in fact, be called a philosophy for an electron, since what we have in the higher "actual occasions," such as ourselves, is an expansion and a refinement of the same processes and principles which obtain in the relations of minutiae. Yet no one can hold that Whitehead depreciates any of the higher values on which men place a premium: *i.e.*, moral, aesthetic, or religious. They may disagree with his theory at points or disregard it altogether—whether from preconception, nonunderstanding, or simple weighting of principles—and hold that his philosophy or religion is not for them or their orbits, but they can scarcely discount his sense of value in any one of these areas. Value and experience are basic to all processes and to all existence.

It is not my purpose to review Whitehead's philosophic categories. They are too encompassing and too intricate. Such a study is for those who are ready for the meat, not the straws or cereal, of metaphysics. It would be a fortunate circumstance if this article could be a preface to such study. Suffice it here, however, to mention simply that Whitehead's is a philosophy of mutual immanences and creative advance in which in an unusual degree the best is gathered from Western history—from Plato to the philosophers of quantum physics. Whitehead, it is assuredly well known, is primarily and distinctively a philosopher of mathematical physics. His unusually inclusive data are brought together in a philosophy of preëminent coherence—an organic philosophy, in fact, of a different order from that of Hegel or of Hegel's successors.

It ought here to be noted especially, moreover, that the notion of organism is one which, for want of a better conception, may well be generalized into a principle. This is precisely what has been done by the highly reputable thinkers just cited. Bruno and Leib-

[26] George Santayana, *The Life of Reason* (New York, 1922), quoted by F. J. E. Woodbridge in *Contemporary American Philosophy*, II, 416.

niz might be added, with not a few others. We have ourselves used the adjective "organic" for indispensable interrelations. In this sense we can say that man and other special organisms are organic to nature. They depend on, utilize, assimilate, and function in nature. And there are certainly senses in which nature depends upon them. The query, whether nature could have avoided producing these organisms, is not just anthropomorphic semantics. Nature did produce them. Could nature have withheld this begetting? This is like asking, "Could the circumstances have been other than they were?" Nature certainly produces life in abundance on our own planet. How can "she" help it? Is not nature in this sense dependent on life and on man, as "events" or emergents not just within but of nature?

As to the interdependence of organisms, it has been postulated[27] that actual physical contacts are essential for balanced and normal post-natal development, and that gross social maladjustments occur when this is denied to a child. Nor is this true only of earlier childhood. It is a variously strong urge till maturity, and not insignificant through life. It may be extensively sublimated. Psychological circumstances, including affections and numerous cross-stimulations, furnish the warp and the woof of existence. Organisms are not just self-contained physical units. They reach out to, and interact with, each other, just as they reach into, and interact with, what we have thought to be inorganic existence. Organicism is then a principle of relation of the units in nature as well as of the nature of the units themselves.

Professor Whitehead's own arguments for the principle of organism proceed from both physiology and physics. For those particular arguments we simply refer to *Science and the Modern World* and *Process and Reality*.[28] Our concern is in indicating the principle. And this is a principle of integrative preëminence. Organisms, in the common usage of that term, are integrations *par excellence*.

[27] By Ashley Montagu for one. *Cf.* "The Origin and Nature of Social Life and the Biological Basis of Cooperation," *Main Currents in Modern Thought* (New York, Spring, 1949), VII, especially p. 19. Note the quotation from Leo Loeb: "In consequence of the more and more intricate interaction between environment and psychical-social individuality, a separation between individuality and environment, especially the social environment, becomes impossible."

[28] *Cf.* especially *Science in the Modern World,* pp. 148-155, 193.

And organism, Professor Whitehead shows evidence to affirm, is a basic assumption of current physics.

The possibilities involved in this principle include the urge to completeness and to the realization of all types of values, a process intrinsic to nature. Ethics, from this standpoint, is a set of principles relating to this process.

It is in order, therefore, to call attention to three ethical Whiteheadean principles which will significantly complement the one excerpted from Immanuel Kant. We quote Charles Malik's summary:

> The first is the general aesthetic law of integrating this world with the aim of producing a maximum effect. Preserve all that can be preserved by balancing the elements against each other in such a way that evil is overcome by positive action and elements of discord take their proper place in the total harmony. Your reward, then, is a real, beautiful, rich satisfaction. The second moral principle is individual responsibility. There is real freedom, real choice, real selection between alternatives. If your society decays and perishes, it is its fault: it could have saved itself if it chose rightly. If you degenerate, it is your fault: you could have arrested your decline in time. And it is never too late, though it may be difficult, to start again. Real individual responsibility is of the essence of Whitehead's metaphysics. And the third principle of morals is that if you are in danger of getting into a rut, [you should] seek the contrasting novelty which enriches. Professor Whitehead is the absolute sworn enemy of staleness. He believes in adventure and freshness, in the endless experimental trying of new ways, always, however, with an eye to improvement and maximum harmony. Repetition without significant novelty, namely, staleness, is the exact definition of death; for death in the sense of absolute not-being does not exist.[29]

Organism is then a principle both of existence and of the most encompassing and finest values that we know. Here is one of our really cardinal integratives. To understand its phases and reaches is to bring our science, arts, history, and religion into an integrally unified view.

It should be significant, finally, to indicate Whitehead's own contribution to integrative achievement. Mr. Justice Frankfurter

[29] *Journal of Philosophy*, XLV (October 7, 1948), p. 579.

has phrased this contribution for the New York *Times*: "From the time he came to Harvard in 1924 he [Whitehead] infused an understanding of the interdependence of the various disciplines. . . . For all who came within the range of his infectious personality, arid professionalism was quickened into exhilarating meaning and the universe expanded. . . . Professor Whitehead's insistence on understanding through the realization of the interdependence of thought and ideas and institutions [was quite different from the device frequently employed by others and] wittily . . . described as the cross-sterilization of the social sciences. . . . He [Whitehead] distrusted closed systems because they imprison the creative possibilities of insight and experience. He was relentlessly exacting of accurate responsible thinking, precisely because he knew that even the most rigorous thought can not achieve fullness of comprehension . . . [and] he ignited to deeper understanding and more beautiful visions the minds of hundreds of students . . . and colleagues themselves eminent."[30]

It may give more immediacy and comcreteness to this discussior if we refer to another philosophy, which is apparently of a quite different order, that of T. G. Masaryk, the first president of Czechoslovakia—a man of clear and high principle, and of principle with a high index of relevance. For thirty-one years a teacher or professor of philosophy, he wrote some definitely significant works. His *Introduction to Concrete Logic* is precisely a study in scientific and intellectual integration. At the same time, he admitted no cleavage between theory and practice, and became himself highly involved in social practice. It is not surprising, therefore, that he reflected in his sixties on how barren and narrow an island[31] academic thought is, and yet also—as he had earlier shown—how functional in life philosophies are. To his thinking, therefore, philosophy became above all "ethics, sociology, politics,"[32] the keynote arenas of the problems of men. But these fields of affairs are not self-sufficient. They have backgrounds in science and nature and assume or involve metaphysical standpoints—outlooks on and conceptions of the world and life. One cannot have an ethics or

[30] "Letter to the Editor," New York *Times*, January 8, 1948.
[31] *The New Europe* (London, 1918). Published privately during World War I. The present reference is to a typed copy secured in 1935.
[32] *The Making of a State* (London, 1927), p. 291. The English version was prepared by Wickham Steed.

social philosophy without having some kind of metaphysical viewpoint and conception. But it is the metaphysics which is put into effect in human living and affairs that is of primary importance. For this reason philosophy became for Masaryk "ethics, sociology, politics"—not just academic abstractions. Yet, unlike the five representatives in Morton White's recent *Social Thought in America* who reacted against "systems of reason" to notions of law, for example, as a device of expediency, Masaryk did not abridge philosophy in the interests of politics or of other affairs. He expounded and deepened politics on the basis of integrative, yet critical, philosophy. In terms of method—not just of philosophy but of politics and of life generally (intelligent "methodology," in other words)—Masaryk's principles were science, philosophical criticism of the sort Kant espoused, and precise envisagement (*exakte Phantasie*) as expounded by Goethe.

In constructive conception, the terms which Masaryk used to designate his focal ideas—realism, humanitism, and theistic or metaphysical synergism—are no longer distinctive. But the meaning which these words entail is revealing. Realism, in its first aspect, is a stress on concrete and indubitable fact. But it is not just a stress on empirical or on scientific fact. "A considerable field of activity is allotted to ideas and ideals; individuals and nations are to a great extent the creators of their own future," and "in the long run it is the idealists who always win. Yet the victorious ideas and ideals are not born of fantasy and indifference to the facts."[33] Realism is therefore both a value and a factual philosophy.

Humanitism is a realistic and not a sentimental or an atheistic humanism. It means, first of all, that one should be a man to the best of his envisagement and capacity, in terms of such principles as the maxim that "truth conquers" when properly determined and supported. It means, secondly, a brotherhood of intellectual, moral, scientific, aesthetic, and religious culture; a realistic maximizing of the lives and values of all; a democracy in realizing significant values.[34]

Metaphysical synergism, finally, is simply an intellectual faith in the dynamic harmony of existence; a faith that order is to be

[33] *Speech of T. G. Masaryk, President of the Czechoslovak Republic, on the Tenth Anniversary of His Country's Independence* (Prague, 1928), p. 11.
[34] Warren, *Masaryk's Democracy*, chap. 8, and Masaryk, *Ideals of Humanity* (London, 1938), chap. 9.

worked with; and a faith that scientifically industrious collaboration with the world's order will succeed. Religion is man's whole set of responses in terms of this or some other world view. It is a function of, as well as a factor in, man's perspective—his sense of citizenship in the total order.[35] Metaphysical synergism might accordingly be called metaphysical democracy.

We pass, therefore, from the notion of organism as a prime integrative to the notion of democracy as its paramount corollary and of democracy as being active and social instead of being statically individual. Democracy, for Masaryk, was an entire philosophy of existence and culture, a philosophy to be built upon science, ethics, politics, economics, art, metaphysics, religion, and the total scope of data and considerations affecting life. While characterizing himself as pitilessly analytic in all his studies, Masaryk said that "the analytical method" was just a means. "The end," he affirmed, "was synthesis and organization, as all my writings show."[36] His sense of principle in this synthesis, and of the complexities involved therein, was a sense of reality which is especially significant because of his incisive participation in immediate yet far-reaching human affairs.

Professor W. H. Sheldon has said that Masaryk's philosophy seems to be an organic idealism. Certainly that is a possible interpretation. Masaryk himself stressed his "concretism" and realism. There is assuredly no denying or discounting of matter and its basic importance in Masaryk's philosophy, nor any depreciating of immediate circumstances and their practical imperatives. There is, however, the relating of the concrete and immediate to its connections and the envisagement of the local in its larger context. "The Czech question," he declared, "I always conceived as a world problem."[37]

Masaryk's philosophy may then be viewed as a kind of organicism, one which is much more like Whitehead's than like Hegel's. In point of fact, Masaryk's philosophy is in no essential sense in conflict with Whitehead's, nor, conversely, of course, is Whitehead's with Masaryk's. They may be considered as different foci of the

[35] *Masaryk's Democracy*, chap. 9; see also "Philosophic Genius and Social Living," *Furman University Bulletin*, N. S., XVII (January, 1936).
[36] *The Making of a State* (London, 1927), p. 292. See also *Masaryk's Democracy*, chap. 2.
[37] *The Making of a State*, p. 293.

same general point of view and as complements or, to some considerable extent at least, completions of each other. Both are specifically relevant, in any case, to the question of integration in contemporary culture and thinking. Their principles, to belabor the point, are principles of integration, and some of them are prime integratives.

We have now distinguished a number of principles. Chief among these are man as the measure of value; individual man as the ethical end—with the coördinate ethical and aesthetic principles of individual responsibility and of the maximizing of integrative significances; continuity as a principle of existence which becomes a principle of man's relation to "nature" and of the connection of values with factual existence; and organicism as a philosophical conception not just of individual existences but of the relations of individuals to and in nature.

These principles are certainly not incongruous or inconsistent, but are compatible and, in fact, complementary. In the principles of continuity and organism, especially, we have the possibilities of the union of science and the humanities—science with its stress on facts and precise laws, or rather precise laws which accurately subsume indubitable facts, and the humanities with their emphases on experiences of significance and value.

This is the crucial problem in integration—the coördinating of science and the humanities. Logic can relate, or at least validate the presumed relations of, purely factual conceptions. A philosophy of continuity and, more particularly, of organism, however, is required for the relating of facts with values, though values also are factors in experience. Science, by disclosing, with as much accuracy as possible, the specific circumstances in which values function, is significant for values. It is in a philosophy of culture, however—including such philosophies as those of science, art, ethics, religion, and history—that discriminations and applications of essential principles like continuity and organism are effected. Science, literature, art, and history, as such, function essentially in their own special contexts without regard for the data beyond their specific interests or focus—perhaps even without especial concern for relationships within their own areas. Their respective philosophies, however, may be brought to focus in a philosophy of culture, with definitive principles. It is some of the most signif-

icant of these principles which we have tried to bring into the foreground.

We have illustrated the possibilities for elaborations of principles with their respective corollaries and subsidiaries, with special reference to the philosophies of A. N. Whitehead and T. G. Masaryk. Whitehead's philosophy is preëminently metaphysical, and pitched on a very considerable level of abstraction. Masaryk's principles are likewise philosophical. Yet they are more nearly matters of the most adequate conceptions for dealing with major issues in living. Metaphysics is integral and important, but much more of a background for living than of immediate focus. Masaryk was concerned with the relative immediacies of statesmanship. His principles were not compromises. But his work was integrative on the more obviously functional level. His great contribution is the principle of the relevance of theory, including metaphysical world theory, to socio-personal practice.

Both of these views are distinctively significant for disclosures of principles for intellectual order and meaning. Some combination of the two types of outlook seems, in fact, not merely possible but essential to an adequate set of integrative conceptions.

It should now be evident that the quest for first principles is not just a simple matter of an adoption of assumptions or of the acceptance of sentiments of those who think they espouse, or know who espouses, the essential values of life. It is an operational and an historical process. Philosophical outlooks have to be put to the tests, over centuries, of their logics, of their compass and relevance, and of their values in function. Revision goes on. Rejections occur. New insights and new perspectives emerge. New principles are conceived. Comparisons and assimilations are effected. The results may represent an important advance or simply a makeshift accommodation to circumstance and criticism.

Most sets of "first principles" work in some fashion. But the integrative test is especially significant. What does a set of principles leave out, discount, or deny? With any group of principles or integratives there are bound to be recessives if not exclusions. Only the thinking and experience of millennia can disclose the best integrative conceptions; all philosophies are experiments in just this sort of thing.

Meantime we can learn from the ablest distillations of human ex-

perience and reflection, and thus effect our own integrations by crystallizing or refining, and by amplifying, our own first principles. Masaryk might, indeed, point our intellectual temper in the terms of his philosophy of life and statesmanship. "True philosophy and science," he recapitulated,

> demand that men should think, that they should gather wide experience, observing and comparing the present and the past, and verifying their deductions from experience by further experience so that haste may not lead them to fantastic conclusions. In art, as in politics and life, there is a difference between fantastic imaginings and the power of imagination, pure imagination as Goethe called it, for precise imagination is a very necessary means to right and exact thinking. A thinking man, ponderate in action, is he whose power of imagination can take him beyond himself, free him from the circumstances to which custom has bound him—a man who, by feeling and thought, can enter into the lives of other men and other times, immerse himself in the spirit of his race, . . . of humanity. . . . Even then he will be modest and remember that men are no Titans, let alone gods.[88]

[88] *Ibid.*, p. 397.

MODERN USES OF ANCIENT SOURCES OF HEAT

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FROM the discoveries of archaeologists we have learned that primitive man made his home in natural caves, presumably to find shelter from his enemies and to escape from cold and rain. The heat contained in the crust of the earth served to keep his crude home warm, but it was a source of heat over which he had no control. Moreover, because of its comparatively low temperature, it was far from being an ideal heating plant. But, oddly enough, modern man is returning to that same source of heat to keep his home warm. The purpose of the present article is to explain why modern man finds it desirable and possible to return to this source of energy and, with an improved method, to utilize the heat stored in the crust of the earth. This purpose will be accomplished by drawing the reader's attention to outstanding events in the development of the science of heating homes and by briefly discussing some of the principles used in home-heating systems.

Probably one of man's greatest accomplishments was his invention of a method to produce fire. This invention, or discovery, not only made it possible for him to live in greater comfort in accustomed localities; it also enabled him to venture into regions that were forbidden to him before the discovery. In the warmer climates huts and shallow caves may have been fairly comfortable without a fire; but in colder climates the necessity for heating the home became imperative, and the problem of conducting the smoke and gaseous products from fires in the interior of the living quarters had to be solved. The early Egyptians, the Greeks, and the Romans for a time solved this problem by evading it. They used charcoal in braziers, or in open metal-basins, for heating their homes. When men began using other fuels, they solved the problem of gases and smoke simply and naturally by means of the open fireplace.[1]

[1] *Encyclopaedia Britannica* (9th ed.), III, 343; XXII, 579.

It is interesting to note that the open fireplace heats the room in which it is situated principally by means of radiant heat; the air that is heated by the fire plays no part in heating the room before it passes up the chimney with the gaseous products of combustion and with smoke.[2] More than two thousand years ago the Romans, who for centuries had had open fireplaces in their kitchens, also began to use radiant heat for the purpose of heating certain rooms in their public baths and in the homes of the wealthy, as a result of the invention of the hypocaust or hot-tile system about 100 B. C. The room to be heated had a concrete floor supported by small pillars about two feet high with an open space about them. Hot air and gases from the furnace were conducted through flues to this space under the floor and from there to flues in the walls, through which they escaped into the outside air.[3] Thus the room was heated by radiation from the warm floor and walls.[4]

No progress was made in the development of heating systems for several centuries after the Romans had designed their hypocaust system except for the invention of the hot-air furnace,[5] which, in its present form, is largely a modification of the system of heating used by the Romans. In the Roman system the air in the room was heated by direct contact with the floor and walls, and the objects in the room were heated chiefly by radiation from the floor. In the modern hot-air system, by contrast, the air is heated in an inclosure surrounding the furnace, and it is then conducted into the room which is to be heated. There the heated air mixes with the air in the room and also displaces some of it. The greater part of the radiant heating takes place in the furnace. In the light of present-day knowledge of heating, the step from the hypocaust method of heating to that of heating by hot air must be viewed as a step backward. This conclusion derives from the supposition that radiant heating, with the elements in the floor, is more satisfactory from the standpoint of comfort and health than is heating with hot air.

The usual layout of a heating system is the following. When the furnace is situated at a distance from the space to be heated, it is necessary to employ a medium to convey the heat from the

[2] T. Napier Adlam, *Radiant Heating* (New York City, 1947), pp. 6-7.
[3] *Ibid.*, p. 7.
[4] Strange to say, many people today consider this method to be novel.
[5] T. Napier Adlam, *op. cit.*, p. 7.

source to its destination. In the hot-air system, air is the medium which performs that function; in some systems steam is so used; and in other systems water serves as the medium. Thus for centuries the accepted design of a heating system consisted of a source of heat at a high temperature, of a medium to carry the heat, and of a receiving space at a temporature lower than that of the source. This pattern was dictated by the natural law that heat always flows from a region of high temperature to one of low temperature, and also by the fact that no means had been devised whereby the reverse process could be performed. This law of nature has prevented the use, for domestic heating purposes, of large quantities of heat that are stored in the soil, in well water, and in the atmosphere. In comparatively recent times, however, progress has been made toward overcoming this obstacle; and it is not extravagant to predict that soon these immense storehouses of heat will be serving many families. This progress necessarily consists in producing an apparent contradiction of a law of nature; that is, in inducing heat to flow from a cold body to a body of higher temperature.

To control a law of nature in such a manner that a desired result may be produced requires imagination, patience, and a thorough knowledge of the science in which the law holds sway. The idea of transferring heat from a cold body to a hot body was not conceived until serious study of the theory of heat engines was undertaken. At the time Sir William Thompson (1824-1907)[6] proposed this idea in 1852, and for many years thereafter, the proposal was treated as a highly imaginative bit of speculation which would no doubt be valuable in the study of heat-engine theory, but which probably would never be practically applied.

Almost every convenience and luxury we enjoy today was once the dream of someone who was bold enough to break away from tradition, and who was brave enough to keep on working despite the doubts, and often the ridicule, of his contemporaries. In fact, dealing with abstractions is as important to the success of the scientist as it is to the success of the poet or the painter. For example, in his world of imagination the scientist concentrates great quantities of matter at a dimensionless point and also builds

[6] Sir William Thomson (Lord Kelvin) contributed to many branches of science, including electricity and magnetism.

apparatus with "imaginary" materials, some of which are absolute insulators of heat and electricity while others are perfect conductors. He thinks nothing of specifying diaphragms which are impervious to gases, but which are capable of passing through each other without leaving a trace of their passage. He deals with weightless, frictionless, perfectly rigid bodies with dimensions that are infinitely large or infinitesimally small. His abstract world of electrons, protons, ions, and molecules with their fields of force will satisfy the most ardent dreamer.

Nevertheless, we should understand that the scientist is aware that he must be realistic when he attempts to employ his theories for the benefit of mankind. He knows that the laws of nature will brook no fooling, and that he must adjust himself to the world of reality in which he lives if his attempts to utilize the laws of nature are to be worth while.

The dream with which we are dealing in this article has to do with the very ordinary but important human task of heating a house. In order that we may appreciate to a greater extent the visionary nature of Lord Kelvin's proposal on this homely subject, let us describe briefly the status of the theories of heat in his day.

In the early part of the nineteenth century the caloric theory, which held that heat is a kind of fluid that flows into or out of a body when its temperature is lowered or raised, was losing ground to the belief that heat is a form of energy. Although heat engines had been successfully employed for more than a century, the nature of the agency which supplied the energy was not well understood. The situation was clearly described by Sadi Carnot (1796-1832),[7] a French scientist, who in 1824 made this statement: "Notwithstanding the work of all kinds done by steam engines, notwithstanding the satisfactory condition to which they have been brought today, their theory is very little understood, and attempts to improve them are still directed almost by chance."[8] Today every scientist knows that an art based on chance is not trustworthy, and that scientific advances into theoretically unexplored regions should not be attempted. In fact, the incentive to make scientific

[7] Carnot saw that, to investigate the laws of heat engines, it is necessary to imagine the simplest case, that of a frictionless engine in which there is no loss of heat by conduction.

[8] Morton Mott-Smith, *The Story of Energy* (New York, 1934), p. 35.

advances rarely exists before a knowledge of the theory points the way.

Despite the uncertainty concerning the nature of the motive power with which he was dealing, Carnot conceived and described the cycle which the heat engine should follow for the most efficient use of the energy supplied. A better cycle has not yet been devised, even though since Carnot's time a great amount of research on the transformation of energy has been done, and much has been learned about heat energy. The Carnot cycle is the ideal for which all designers of steam-power plants and of internal combustion engines strive. There are times when the physical limitations of the medium which transports the energy and of the materials used in the construction of the plant force the designer to adopt another theoretical cycle; but always the Carnot cycle is the real goal he aspires to attain. The Carnot cycle represents the height of perfection in the utilization of heat; it employs perfect processes, a perfect medium, and a perfect engine.

At the beginning of the 1850's two scientists, Rudolph Clausius (1822-1888)[9] and Sir William Thompson (now Lord Kelvin), combined Carnot's theory with the principle of the conservation of energy and worked out the mathematical details of this combination. In 1852 Lord Kelvin, after an extended study of Carnot's theory as amplified by Clausius and himself, presented the following proposal to the Glasgow Philosophical Society,[10] a proposal which we may call Lord Kelvin's Dream. The following description of a method he proposed for heating a building is almost an exact quotation from his notebook. A furnace will supply heat to a Carnot engine, which will in turn drive another Carnot engine running in reverse, the latter engine thereby becoming a "heat pump." The driving engine will exhaust heat into the building, and the heat pump will take heat from the atmosphere and deliver it to the building also. Under ordinary winter conditions the house would receive more than four times as much heat as the furnace would supply to the engine. Moreover, by reversing some of its elements, the heating plant could be used

[9] Clausius conceived and named the mathematical entity called entropy, which is used extensively in the science of thermodynamics.

[10] E. B. Penrod, "Continuous Air Conditioning with the Heat Pump," *American Scientist*, XXXV, No. 4 (Autumn, 1947), p. 502.

to cool the house in the summer time,[11] as Lord Kelvin was able to show the members of the philosophical society by means of very simple mathematical and thermodynamic principles.

Let us use a water analogy to illustrate the principle on which the heat pump works. Imagine a garden planted beside a small stream, and a reservoir situated above the garden on higher ground. The owner of the garden contracts with the owner of the reservoir to supply him with water to irrigate his land. The gardener uses the water from the reservoir to actuate a hydraulic turbine which drives a pump that draws water from the stream. Both the water discharged from the turbine and that raised from the stream by the pump are used for purposes of irrigation. If the reservoir is four times as high above the garden as the garden is above the stream, then, with a perfect turbine and a perfect pump, the garden will receive five times as much water as the man buys.

It is evident that a certain fixed quantity of water is needed to irrigate the garden adequately. It is further evident that the cost is much greater when the entire amount of water used for irrigation is derived from the reservoir than is the case when the turbine and the pump are used in the manner just described. In the light of these facts we might consider the gardener to be stupid if he irrigated with the reservoir water alone, and did not also avail himself of the supply in the stream. Yet we blunder in exactly the same manner when, in order to heat our homes, we heat a medium to a high temperature and then allow it to dissipate its energy without doing useful work while its temperature is falling. Some industries partly eliminate this fault by generating electricity with the steam produced by their boilers before using the steam for heating purposes.

Now let us return to the subject of the heat pump and describe an experiment which can be performed with familiar apparatus. Suppose a large refrigerator with the cabinet door removed were installed in a small room. Imagine further that the walls, the floor, and the ceiling of the room are perfect insulators of heat, and that the room can be hermetically sealed. The only connection with the space outside the room is the cable that leads from the motor in the refrigerator to the switchboard in the hall. The re-

[11] *Ibid.*, p. 502.

frigerator is started; the room is tightly closed; and a record of the room temperature is recorded by a suitable instrument.

We might assume that the temperature in the room would gradually fall as the refrigerator continues to operate, but after a moment of reflection we should perceive that the following cycle of events will take place. The temperature of the air that enters the cabinet of the refrigerator will be lowered; but the heat, which will be virtually squeezed out of the air, will be returned to the room by the condensing coils.[12] Thus the tendency under such conditions is to maintain a constant room temperature.[13] However, because the energy supplied from the outside to the motor will show up as heat which cannot escape, the temperature in the room necessarily will rise. In fact, as far as the results are concerned, the experiment would not be altered if we were to replace the refrigerator with an electric heater having the same electrical input as that of the motor.

The foregoing experiment has been described to emphasize the fact that the electrical energy which the motor transforms into work ultimately appears as heat. It is an example of the transformation, or of the indestructibility, of energy. In order to gain an understanding of the system of heating with the heat pump, it is necessary for us to understand the principle of the transformation of energy.[14] Similar examples of the transformation of energy are observed daily by many of us. For instance, a busy subway ordinarily is uncomfortably warm during the summer time, largely for the reason that the electrical energy employed to run the trains is converted into heat faster than it can be withdrawn from the tunnel. In contrast, during the same kind of weather an infrequently used cellar is comfortably cool. That the concept of the indestructibility of energy is not understood by the general public may be inferred from an advertisement which appeared frequently in a New York newspaper during the winter of 1946-47, in which the statement was made that a certain electric heater "is a modern, mechanical, electric heater scientifically designed on convection principles to dissipate more

[12] The condensing coils are the warm ones outside the refrigerator cabinet, and the vaporizing coils are the cold ones inside the cabinet.

[13] We are assuming perfect mixing of the air, thus eliminating hot and cold pockets.

[14] This principle is commonly known as the conservation of energy.

B.T.U.'s [heat units] than any comparable heater. *No blower, and therefore no wasted heat.*" We are prompted to ask, "What becomes of the energy supplied to the motor?"

In order to perform the experiment in our illustration so as to comply with the requirements laid down by Lord Kelvin, the heat which is rejected by the refrigerator should be conducted into an adjacent room. With this arrangement, the temperature in the room in which the refrigerator is installed will fall, and that in the other room will rise. Then, to insure an unlimited source of heat for the system, the windows of the cool room should be opened to admit the outside air.

At this point in our discussion it might appear that the seemingly fantastic idea of Lord Kelvin has become a reality. This however, is only partly true. The system we have just described has proved to be all right as a refrigerator, but when we endeavor to use it as a heating plant the demands of the public and the realities of nature impose some difficulties that must be overcome. Prospective purchasers, for example, are usually realistic about buying something. Consequently, before they buy a new and different heating system they will commonly ask questions such as the following: "What is the initial cost?" "Will the system work without interruption?" "Is it the best possible solution to the heating problem?" Much of the present-day research on heating plants of this type is directed toward answering these questions.

One of the most important requirements of such a system as Lord Kelvin proposed is a large and reasonably constant source of heat. Researches are being conducted on three such sources which seem to fulfill these requirements in varying degrees. These sources are the atmospheric air, subterranean water, and the soil. None of these, however, is without its drawbacks. Several difficulties, for example, are encountered when the atmosphere is used to supply heat. First of all, the outside air contains moisture which forms frost on the vaporizing coils. Frost, being a poor conductor of heat, interferes greatly with the proper functioning of the system. Secondly, great quantities of air are needed to supply the required amount of heat. To provide this air bulky equipment is required, and such equipment is undesirable because it occupies considerable space and also because it is costly. Thirdly, the outside air contains the least amount of heat when the need for

heating buildings is the greatest—that is, in the winter. And, finally, the daily variations in the atmospheric heat require frequent adjustments of the elements of the system either by automatic devices or by a competent attendant. The chief advantage of a system employing the atmosphere as the source of heat is the ease with which such a system can be converted from a heating plant to a cooling plant.

Well water as a source of heat also has disadvantages. One of these is that frost will form on the pipes which convey the water. Another is that the supply of water may not be always adequate in a district in which several wells are close together. This disadvantage is most likely to arise when the water discharged from such a system is not returned to the soil in the immediate vicinity of the wells. The chief advantages of this source of heat energy are its constant temperature, the large amount of heat it contains, and the ease with which a system using it can be installed.

According to some investigators, the most promising source of energy for the heat-pump system is the heat which the soil contains.[15] The essential elements of a system using such a source of heat and the method of operating such a system are described in the following paragraph.

The low-pressure, or suction, side of a compressor is connected to a coil of pipe that is buried below the frost line in the soil near the building in which the heating system is being installed. The high-pressure, or exhaust, side of the compressor is connected to another coil of pipe which is surrounded by the air to be heated. The low-pressure coil is the vaporizing coil, mentioned earlier in connection with the refrigerator, and the high-pressure coil is the condensing coil. The two coils are connected to each other by an expansion valve which permits a liquid refrigerant, usually Freon 12, to pass in small quantities from the high-pressure region to the low-pressure region. When the liquid passes through the valve, it vaporizes and expands into the low-pressure coil that is buried in the ground. The expansion of the vapor causes its temperature to fall several degrees below that of the ground which surrounds the pipe, thus inducing heat to flow from the ground into the pipe. This heat vaporizes any liquid that might be carried

[15] E. B. Penrod, "Continuous Air Conditioning with the Heat Pump," *loc. cit.*, p. 524.

by the vapor and also raises the temperature of the resulting gas. The heated gaseous refrigerant is then drawn back to the compressor where its pressure is raised, a process which is accompanied by an increase in temperature. The hot gas is then forced into the condensing coil, and while it is passing through this coil it gives up its accumulated heat to the air surrounding the coil. As a result of this transfer of heat, the gas reassumes the form of a liquid. This cycle is repeated as long as the pump is in action.

A point of particular interest in the process described above is the fact that the refrigerant alternately changes from a liquid to a gas and then from gas to a liquid during the cycle. When a substance changes from one form into another, it either gains or loses a large amount of heat with a minimum of change in pressure. For this reason engineers always design a refrigerating system so that the refrigerant must pass through this cycle.

One of the disadvantages of extracting heat from the soil for heating purposes is the expense of burying the pipe. Because of this expense, the designer of the system must have rather accurate data concerning the rate at which heat flows through soils of different types. The determination of the rate of flow is a complicated problem, for the rate is influenced not only by the character of the soil, but also by the amount of moisture it contains and by the length of time during which the pump operates. The variable due to the time element tends to reach a steady state after prolonged operation; hence experiments made to ascertain this variable must be of long duration. Tests must be performed in widely scattered locations for long periods of time and under varying conditions before reliable information can be assembled for the guidance of designers of such heating systems.

To obtain information of this kind experiments have been performed at the Illinois Institute of Technology, at the University of Kentucky, and at the University of Connecticut. In addition, many research projects have been conducted by public utility companies independently of universities and technological institutes.

According to a report on one of these projects which appeared in the August, 1949, issue of *Mechanical Engineering,* a twelve-story office building in Portland, Oregon, was heated during the severe winter of 1948-49 by means of heat extracted from well

water. The authors of this report state that the cost of heating the building with the heat-pump system was less than one-half the cost of heating it with coal.[16] This report justifies the conclusion that such a system is feasible, and, when sufficient data are available to prove its feasibility, well water may be used extensively for heating buildings.

In this brief paper we have traced the evolution of methods of heating homes from primitive days to our own time. Primitive man availed himself of natural heat wherever he found it, but modern man has acquired considerable control of the conditions under which he uses heat. Equipped with the knowledge and the technological skill he has accumulated through the ages, he is now able to utilize for his comfort vast stores of energy which nature has always provided, but of which primitive man because of his ignorance could make little use.

[16] The authors of this report estimate that an operator could save from $150 to $250 a month in operating costs by using a system of the size employed in the test. It should be noted, however, that the building referred to in the report had a great many large windows through which energy from the sun entered and was trapped in the room. Thus the heat from the heating system was supplemented.

HIPPOCRATIC MEDICINE AND SCIENTIFIC METHOD

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OF THE approximately seventy-five works, differing most widely in their contents and purposes, which together constitute the *Corpus Hippocraticum*—the body of ancient medical writings which has descended to us, according to tradition, from the school of Hippocrates of Cos—one, the little work entitled *On Ancient Medicine*, has assumed a peculiar significance in the eyes of most modern scholars of ancient medicine. To Emile Littré, the learned and indefatigable editor of the Corpus about the middle of the last century, this work was the keystone of Hippocratic medicine, and of such significance that he assigned to it the first place of honor, selecting it to introduce his monumental edition. In his judgment, the treatise contained "une polémique, une méthode et un système" which could properly be attributed to Hippocrates himself, although there exists no early ancient authority specifically justifying the attribution.[1] The treatise is undoubtedly of early provenience, most probably having been composed in the last quarter of the fifth century B. C.[2] But scholars after Littré, particularly those of the last generation, have concluded, exercising greater

[1] The treatise was rather obviously *not* attributed to Hippocrates in antiquity. It is somewhat puzzling that *On Ancient Medicine* did not elicit much greater interest among physicians succeeding the age of Hippocrates. It is first mentioned by Erotian, a rather poor authority of the age of Nero. It was apparently not known to Galen, the greatest student of medicine in antiquity, after Hippocrates, and a commentator on many Hippocratic treatises. The solution to the puzzle may be that the development of medicine after the Hippocratic period was increasingly based on principles quite foreign to those considered basic by the author of *On Ancient Medicine*. This was true, to a large degree, even after the work of Aristotle. Hence, the treatise would have seemed to later physicians and thinkers to offer little that was germane and even less that was practical.

[2] The probable date may be fixed within these limits on linguistic and internal grounds, with tolerable certainty, and this is the consensus of most scholars. Any attempt at more precise dating is temerarious. The evidence, possibly, suggests the earlier years of the last quarter of the fifth century, but is too tenuous to provide certainty.

critical restraint, that *On Ancient Medicine* cannot really be the work of Hippocrates, although they do maintain that it expresses the fundamental spirit of Hippocratic medicine and possibly derives from some pupil or follower of Hippocrates.[3] Doubts concerning the authorship of the treatise do not, however, lessen the significance of the ideas and principles its anonymous author proposed with such vigor and originality. *On Ancient Medicine* continues, and rightly, to stand as a *chef d'oeuvre* of early Greek medicine. But it has, in fact, a significance far transcending its position of importance in medicine, since it contains the first extant attempt to demarcate the respective spheres of "philosophy" and "science," and to enunciate the principles which should underlie the work of the latter.[4] Such an attempt was as much to be desired as it was revolutionary, since the principles which were proposed would represent a drastic alteration of the pattern of intellectual procedures of the fifth century B. C., during which scientific and philosophic inquiries, which are essentially disparate in nature, had been comprised without differentiation of any kind within the framework of pre-Socratic natural philosophy. In opposition to the method of natural philosophy, *On Ancient Medicine* presents and illustrates that method of acquiring knowledge which later ages have learned to call scientific. As such, it is a document of profound importance in the history of the development of ideas.

In estimating the author's achievement, a conception of the purpose and plan of *On Ancient Medicine* is essential, since the work is not a straightforward, merely expository, factual description of earlier medicine, as the title might suggest. Rather, it is controversial in nature, a polemic directed against those theoretical thinkers and certain medical practitioners who, in opposition to the

[3] As research proceeds, it is becoming increasingly doubtful whether we shall be able, with any real success, to attribute *any* of the works of the Corpus to Hippocrates, since specific ancient evidence for doing so is unavailable. The unique difficulty of the "Hippocratic" problem is that we do not have any incontrovertible evidence concerning the medical doctrine of Hippocrates himself which might be used, when applied to the works of the Corpus, as criteria of Hippocratic authorship. The peculiar difficulty of the "Hippocratic" problem has been analyzed by Ludwig Edelstein, "The Genuine Works of Hippocrates," *Bulletin of the History of Medicine,* VII (1939), No. 2.

[4] The concept of "philosophy" had not yet crystallized into the narrower, more restricted connotation of later ages. *Cf.* Werner Jaeger, *Paideia,* III (New York, 1944), p. 19. Our author himself provided (chap. 20) one of the earliest uses of the word for "philosophy," but such use was not yet technical.

method and principles of contemporary medicine as conceived by the author, wished to base medical theory and practice on a priori philosophic "hypotheses"—a tendency which had gradually developed during the latter half of the century as the attention of natural philosophy had focused increasingly on the microcosm rather than on the macrocosm. This is the real purpose of the treatise, which is, however, far from being merely negative or obstructive in its total effect. For, to accomplish this purpose, the author undertakes to demonstrate that medicine, as then known, is a real science (*technē*), with an old and well-established content and method of its own, in the development of which natural philosophy had played no part at all. His promise to reveal the essential nature of his *technē* leads him to advance a theory to explain the origin and development of medicine. The method of his *technē* he conceives to have emerged naturally in the growth of medicine, and to be, therefore, the only appropriate method. His discussion, thus, revolves around three major points: his opposition to the use of philosophic "hypotheses" in medicine, the origin of the *technē* of medicine, and the methodology of the *technē*. The last topic is not given direct, systematic treatment in its entirety; for the most part, the author's conception of method must be abstracted and inferred from his controversial remarks and from his medical illustrations of the proper method in medicine.

It is in the most bitterly controversial portions of his argument that the fundamental principle of the proper method of the *technē* is implied. The grounds of this controversy must consequently be thoroughly examined. The author introduces the controversy immediately:[5]

> Certain thinkers and writers on medicine, after postulating some new "hypothesis" of their own as a basis for their argument, attempt to elaborate an aetiology of all diseases on the basis of their "hypothesis." For example, postulating either "hot or cold, moist or dry" (the traditional opposites or principles of natural philosophy) or whatever else they fancy as the causal principle of dis-

[5] Chapter 1. References are to the Greek text and the translation of *On Ancient Medicine*, edited by W. H. S. Jones, *Hippocrates* I (Loeb Classical Library, 1923). I have, however, quoted in paraphrase the passages included in this paper, rather than in literal translation, in order to convey the essential ideas more clearly in terms of modern concepts.

> ease, they then refer all diseases to one or to two such principles as cause.

The term "hypothesis,"[6] it must be carefully noted, differs quite sharply from our modern concept conveyed by this word. It means a rational, a priori postulate or assumption, a generalization not founded basically on empirical observation of facts, advanced to explain phenomena, by deduction. This is the sense in which the term occurs later in certain contexts in Platonic philosophy, and the concept, if not the term, was basic to much of pre-Socratic natural philosophy. The application of this type of philosophic "hypothesis" to medical theory is sharply condemned on several grounds. First,

> Medicine has no need of "hypotheses" as do the inquiries of natural philosophy. If one attempts to explain the "insoluble mysteries" of transcendental reality, for example, or the "mysteries of heaven or of the regions below," the use of such "hypotheses" is required. Metaphysical inquiries cannot be undertaken at all, unless "hypotheses" are advanced. But it will be impossible for the philosopher or anyone else to determine whether his conclusions are in reality true or not, since there are no criteria by means of which certainty can be determined and the "hypothesis" tested so as to be proved correct or incorrect.

Such "hypotheses," that is to say, are not only not verified, but, in their very nature, are unverifiable; they are consequently to be rejected for the method of medicine, since their use cannot guide the thinker to certainty of knowledge and truth. Research based on such "hypotheses" is thus necessarily futile.

Later in the treatise[7] the author continues the controversy on a more immediately practical level. Here his aim is to demonstrate that it is absurd and impossible for those who seek to derive medicine from a priori "hypotheses" actually to make use of their

[6] The term "hypothesis" (the word is a transliteration of the Greek word) occurs in this treatise for the first time in the extant Greek remains. The distinction between the philosophic "hypothesis" here condemned by the author and the hypothesis of modern inductive science is discussed by W. H. S. Jones, *Philosophy and Medicine in Ancient Greece.* [*Supplements to the Bulletin of the History of Medicine,* No. 8] (Baltimore, 1946).

[7] Chapters 13 and 15. The opposition between the two methods is very clear cut and realistic in the author's mind. He describes in some detail a situation which might be termed an imaginary "experiment."

"hypotheses" in medical treatment. His argument takes the form of imagining the consequences of accepting the "hypothesis" and of trying to apply it:

> If it is the "hot or cold or moist or dry" that causes disease, as such thinkers claim, then proper treatment would consist in administering the opposite "principle" in each pair of opposites as a remedy. But, in fact, no absolute entities such as "hot or cold, or moist or dry" have been discovered, and, therefore, cannot be used in treatment. Such theorists, in actual practice, would be compelled to revert to the principles and procedures of the established *technē*.

No practicable knowledge can result from such speculative thinking in medicine, and to ignore this conclusion, the author maintains, is to violate the essential nature of the *technē*.

It is in the final explicit recurrence[8] of the controversy that the hostility of the author to the innovators' use of "hypothesis" is expressed most strongly. The two positions are really irreconcilable.

> Some physicians and *sophistae* say that it is impossible for one to know medicine who does not know *what* man is (*i.e.*, his ultimate, essential nature) and that it is necessary for a physician who is going to treat men properly to have a complete understanding of this. But this argument leads to philosophy,[9] as in the case of Empedocles and others who have written concerning Nature (*physis*),[10] discussing such questions as, What is the ultimate nature of Man? How did Man first come into being? Of what ultimate elements was Man first composed? In my opinion, all that has been written by such men about Nature has no more to do with medicine than with painting.

[8] Chapter 20. Some of the terminology used in the discussion of natural philosophy shows that the reference is especially to Anaxagoras and Empedocles, both of whom developed theories of medicine also.

[9] This is probably the earliest extant use of the term *philosophia*, and it is evidently a somewhat new and strange term, since the author seems to feel the need of clarifying the connotation of the word. This is further evidence of his consciousness of the distinction between the two approaches to knowledge.

[10] The difficult word *physis* (nature) has in this passage, and elsewhere in medicine, two meanings: (1) world stuff, nature of the whole, the Universe; (2) human nature, the human organism or constitution. The two meanings are not, of course, mutually exclusive of each other. Since Greek thought from the beginning was primarily an investigation of *physis*, the concept was constantly evolving and enlarging.

This sharp passage is very explicit. Natural philosophy, the study of first principles or ultimate reality, has nothing whatever in common with medical science. Hence, the importation of its method—the use of the a priori "hypothesis"—into medicine is mistaken and harmful,[11] since the "hypothesis" is unverifiable, does not provide certain knowledge, and is impossible to use practically in medicine. This is the sum of the author's direct argument against the method of speculative thinking in medicine. Obviously, the grounds of his condemnation contain very clear implications of his conception of medical method, which is basically opposed to that of natural philosophy. He not only rejects natural philosophy as having any contribution to make to his *technē* but, in a most remarkable addendum, suggests just the opposite. This must now be examined.

Immediately after the rejection of the method of natural philosophy quoted in paraphrase just above, the author continues:

> I also think that certain knowledge concerning Nature can be derived from no other source than medicine, that Nature can be comprehended when medicine itself has all been correctly comprehended, but until then I am convinced that this knowledge is far from possible.

This is an extraordinary assertion: medicine does not depend upon natural philosophy but, just the opposite, natural philosophy depends upon medicine. Exact knowledge of Nature may be obtained only through medicine. This assertion has sometimes been taken simply as an expression of arrogance or intransigence—quite wrongly, in all probability. Its meaning can be rightly elucidated, but only in the light of the author's conception of the method of his *technē*. And his conception depends not merely upon an analysis of contemporary medicine, but on his analysis of the origin and development of medicine as a *technē*.

The author's description of the origin of medicine and of its development into a *technē* cannot be examined fully here;[12] how-

[11] That the author was not waging an imaginary or unnecessary battle against the intrusion of philosophic speculation into medicine is proved by the presence in the Corpus of the works entitled *Nutriment, Regimen* I, *Breaths, Sevens,* and *Fleshes,* all seriously medical in intent, and all based on various "hypotheses" of the type condemned in *On Ancient Medicine.*

[12] An analysis in detail and interpretation of the author's theory of the genesis of medicine by the present writer will be published in the forthcoming volume of *Transactions* of the American Philological Association. The evolution of medicine is elaborated chiefly in chapters 3 and 5.

ever, a statement of his theory, as succinct as possible, is necessary, since the contemporary method of the medical *technē* is the prime result of its evolution, as the author envisions it. It was Necessity itself, the author begins, the needs and demands of the human organism (*physis*), which brought about the genesis of the *technē*. In primitive times, human regimen and diet had not yet been discovered; mankind subsisted on the same natural products of the earth as other animals. Such foods and nourishment were, however, unsuited to the human *physis,* and thus caused man great pain, illness, and death. Gradually, over a long period of time, men, taught by experience, began to seek for and find foods which, being more suitable to man's *physis,* did not cause pain and disease. Furthermore, by experimenting with the various natural foods which were available, by molding and altering them in many ways, by blending and compounding and weakening them, etc., so as to harmonize with and suit the strength of the organism, in the process of observing the foods which, variously modified, did not cause illness and death, they ultimately evolved that diet and regimen which men in health now use. In this gradual development of human diet as visualized by the author, it should be noted that all the primary factors in operation—the nature of the organism itself, the needs of the human *physis,* the suitability or lack of suitability of foods for the *physis,* and the determination of this quality by experience and observation—reveal that the author had a strongly awakened consciousness of the genetic concept. He passes then to his explanation of the development of medicine as a *technē*. By a continuation and an extension of the same processes, medicine was discovered. In earlier times, men saw that the same diet and regimen did not suit those who were well and those who were ill alike. They consequently modified the diet of those who were ill, altering the quantity or the quality or the intensity of the nourishment in various ways. With each modification, they observed the effects on the ill of the food administered. Gradually, in long experimentation with the kinds of nourishment suitable to the organism and observation of its effects upon the patient, discoveries were made, knowledge accumulated, and the science of medicine was established. The basic factors involved were the same as those responsible for the genesis of human diet: the nature of the *physis,* its natural demands and needs, experience of and experiment with foods suitable to

the *physis* of the ill person, and observation of the effects of the foods administered to him. This is a conception of the natural and necessary emergence and evolution of medicine, an origin and a development which, in the author's judgment, guarantees the reality and validity of his *technē* and its method. And this is the basis on which he has earlier insisted so vigorously that any other method in medicine is false and impossible. His *technē* and its method have evolved naturally, and the basic epistemological principle of that method is observation. All the principles of medicine, and its method, as the author conceives them by analyzing the contemporary *technē*, are foreshadowed in his theory of the origin of medicine.

It is observation, then, which is the absolute foundation of medical method; this principle is not only stated explicitly, but also, more frequently, implied in discussions where the immediate interest is not the topic of method. Above all, it underlies and is illustrated by all the purely medical doctrines of the treatise; while, from the philological point of view, it is noticeable that *On Ancient Medicine* is particularly rich in words and terms containing the connotation of observation. Not only is the "hypothesis" of a priori, rational origin rejected, but the very opposite principle is advanced and defended in its place. The positive reason for setting up observation as the basic principle of medical method is easily inferred in the author's remark, already quoted, that "hypotheses" must be rejected because no certain knowlege can result when they are used as the principle of acquiring knowledge. The empirical observation of phenomena, on the contrary, does result in certain knowledge (so, at least, the author thinks), and it is, consequently, the method which the physician must use. The clearest statement of the position and principle is offered following the passage already referred to above, in which it has been denied that medicine depends on natural philosophy and it has been insisted that exact knowledge of Nature is really derivable only from medicine. Then the author continues, clarifying his meaning: "I mean this kind of investigation and knowledge, to know exactly what a man is, through what causes[13] he derives his being, and the other similar

[13] The word used here, *aitios*, has a semitechnical force in medical writings. It is the concept of causation on an empirical plane, the observable cause-and-effect relationship. The author's general reference is to the sum total of physiological processes which constitute life.

questions." At first glance, these questions seem the same as or quite similar to the questions of natural philosophy which have been condemned as not pertinent to medicine. That they are not really the same is made clear by the author immediately, when he continues:

> For this at least about Nature it does seem to me that a physician must know, and to be very zealous in learning, What the nature of man is in relation to what he eats and drinks? What he is in relation to his activities and habits? And what will be the effect of each thing on each individual? The physician must not be satisfied, for example, to say simply: "cheese is a bad food, for it causes pain to the man who has eaten too much of it." We must learn what the nature of the pain is, because of what the pain arose, and to what constituent of the man the cheese is unsuitable.

The importance of this passage lies not in the insistence on accuracy and exactness, along with the recognition of the necessity of avoiding general statements of an oversimple nature, though these are evidence, also, of the scientific frame of mind, but in the fact that it is so clearly based on the principle of the observation of phenomena as the only valid source of positive knowledge and medical practice. The principle may be summarized thus: the *physis* of man is affected by the properties of food and drink (and by all his other activities and habits[14] as well), with manifest and observable reactions or symptoms. These reactions are visible to the physician whenever those properties are, in whatever respect, unsuitable to the constituent properties of the *physis*. The physician must determine by observation in the case of each person (since the *physis* varies from one individual to another) what constituent of the *physis* is hostile to the property of the food. This may be accomplished, at least theoretically, by observing the resulting reaction in the *physis* on the part of that constituent.

[14] The principle may be extended also to anything else which has an effect upon the *physis*. For instance (chap. 10), if a man, who has the habit of not eating lunch, does eat lunch, there will be the following observable symptoms: heaviness and sluggishness of body and mind, yawning, drowsiness, thirst; if he goes on to eat dinner also, there will occur flatulence, colic, and violent diarrhoea. The opposite situation, of the man who does not eat lunch when it is his habit to do so, provides the following observable effects: prostration, trembling, faintness, eyes becoming hollow, urine yellower and hotter, mouth bitter, the bowels seeming to hang, dizziness, and depression.

Further evidence concerning the conception of empirical observation and the basic rôle it assumes in medicine is provided incidentally when we turn to the second principle of the author's theory of method in medicine—the use of hypotheses of a kind which may justly be termed scientific. Here we are dealing with a conception very similar to that of our modern hypothesis, although the author does not give a specific technical name to the process of arriving at the hypothesis.[15] Indeed, his direct discussion of this aspect of method is very restricted, even though the specific intellectual process conveyed by the term ***hypothesis*** is illustrated in all his medical doctrine and is clearly characteristic of his mind. By hypothesis the author means a theoretical assumption designed to explain the factual data and phenomena which have been obtained through the process of empirical observation. The broadest hypothesis advanced by the author of *On Ancient Medicine* is his basic theory of health and disease.[16] This hypothesis is probably not totally original with the author himself;[17] the evidence concerning the growth of medicine makes it more likely that the hypothesis has had a long and slow growth, with certain variations, within the fabric of empirical medicine. But certain aspects of the hypothesis as it appears in *On Ancient Medicine* render it, in fact, unique. The author prefaces his exposition of his hypothesis with a denial of the rival "hypothesis" of natural philosophy, that "hot or cold, moist or dry" are constituents of man and the source of disease in man.

> Rather, the constituents of the *physis* are salt, bitter, sweet, acid, astringent, insipid, and countless other elements. Earlier physicians saw that each of these elements is necessary to the *physis,* and that each element may be,

[15] The term *logismos* (reasoning) is the only term mentioned in this connection (chaps. 12 and 14). It does, in fact, as used in the context, contain quite clearly the connotation of the hypothesis, but it is not yet fully technical nor used self-consciously. Like all pioneers, the author is struggling to express a concept not yet completely crystallized.

[16] The most systematic statement of this hypothesis is found in chapter 14; it is reflected briefly in other places, and is illustrated repeatedly in the medical remarks.

[17] It probably has some affinity with the much earlier theory of Alcmaeon of Croton. *Cf.* Max Wellman, *Sudhoffs Archiv für Geschichte der Medizin,* XXIII (1930), pp. 300 ff. It is likely that the basic concepts of *krasis* originated with Alcmaeon and became later the common property of several schools of medicine, being, however, handled in different fashions as time passed and medical theory grew.

under certain conditions, injurious to the *physis*. For each one of these constituents possesses "powers" (*dynamis*)[18] of all kinds in number and "intensity" (*ischys*).[19] It is the "intensity" of each constituent, that which is too powerful for the human *physis*, which causes difficulty and brings on disease. Extreme sweetness is the strongest quality of the sweet, extreme acidity of the acid, and similarly of the other constituents. Each has a highest point of degree or "intensity." When the constituents of the *physis* are perfectly mingled and blended together [here he utilizes the famous concept of *krasis*], then neither are the constituents manifest or observable, nor do they cause pain; when, however, one constituent is isolated and set apart by itself, either in quantity or "intensity," then it does manifest itself, becomes observable to the physician and causes pain and disease. Further, if foods are eaten which are unsuitable to the *physis* (*e.g.*, if the "intensity" of bitter or salt or acid, etc., is too great), or if they are unblended, they manifest themselves as secretions as do the humors of the body. Every food that is consumed has its own particular essential property and "power," which may further be altered by modifications of various kinds.[20] The physician must observe and examine the unique "power" of each food consumed by the man. This is necessary since, by each of these, the *physis* is affected and altered in one direction or another, and upon them depends the whole life (*bios*) of the individual, in health or in sickness. The sum of knowledge, accumulating over a long period, of the ways in which the *physis* may be affected by the properties of that which is eaten constitutes the medical *technē*. This knowledge has been obtained, first, by observation, and, secondly, by "reasoning" (*logismos*) appropriately applied to the human *physis*.

[18] The word *dynamis* is technical in the author's usage. All translations are inadequate to render the meaning it conveys. It is defined by Plato (in *Phaedrus* 270c-d) as the essential property of a body by virtue of which it has the power to act upon some other body or to be acted upon by some other body. The concept of *dynamis* is immensely important in the author's medical hypothesis. Compare the study of the author's use of the term by Jones, *op. cit.*, pp. 93-6, note 6.

[19] This word, as used in the treatise, becomes semitechnical. Its meaning, the idea of intensity or degree, is peculiar to *On Ancient Medicine*.

[20] For instance (chap. 13), the original property of a particular food may be changed when the food is exposed to fire or mingled with water, since fire and water have essential properties also, which are blended with the properties of the food. So, too, the processes of sifting, winnowing, kneading (chap. 14), by which bread is prepared, alter the essential property of the grain, which then has a different effect on the body of man.

In the context, the function of "reasoning" can mean only the attempt by the mind to frame an hypothesis based upon the phenomena that have been empirically observed. The validity and truthfulness of the particular hypothesis that might result from such a process is not, of course, a matter of concern in this inquiry, but only whether the process of making the hypothesis is scientific, *i.e.,* whether the hypothesis is drawn from observed data. In the case of the procedure urged by the author of *On Ancient Medicine,* it is observation which comes first, then reasoning based on such observation. The characteristic difference between this scientific hypothetical procedure and the a priori "hypothesis" of philosophy is perfectly obvious. But the distinction had not previously been explicitly made.

As it happens, the process of framing an hypothesis is illustrated[21] at some length in the author's opposition to the rival "hypothesis" that the cause of disease is the influence on the *physis* of "hot or cold." His opposition springs from an hypothesis of his own concerning the nature and effect of the "hot and the cold." His hypothesis, which is everywhere based on his medical experience, is as follows: "Heat and cold are not the causes of disease, because they supervene naturally, and spontaneously and quickly neutralize each other." This theoretical principle is not, of course, simply asserted dogmatically. The author proceeds immediately to cite a large number of observations of phenomena in which heat spontaneously overcomes cold in the organism, or cold heat, producing, therefore, the condition of blending (*krasis*) of these properties from which no physiological difficulty can arise. He anticipates a vigorous argument against his theory, namely, that in the case of patients with high fever and other symptoms of virulent diseases heat does not seem to be neutralized spontaneously or moderated at all. This, however, he takes as the highest "evidence" (*tekmērion*) that fever is not caused by heat, but by other "powers" (*dynameis*), heat being merely concomitant.[22] To prove this, he introduces further pieces of evidence (*sēmeia*), first, the more obvious phenomena, those common, as he says, to the

[21] Chapters 16-19. When the author defends his hypothesis, it is completely on the basis of appeals to phenomena, and his procedure is quite self-consciously carried out.

[22] The author has a tentative, still rather vague, understanding of "temperature." As is pointed out by Jones, *op. cit.,* p. 80, note 6, the very difficult concept of "temperature" is just in the process of being evolved.

experience of all, then the more involved physiological conditions. These latter consist of descriptions of the phenomena of various conditions when heat or cold are observed to be present in the organism. An analysis of the phenomena of each condition, however, especially the observed necessity of the occurrence of *coction* before a cure results, proves that heat and cold are merely concomitant. They are symptoms, but not the true causes of the condition. His hypothesis is, in fact, built primarily on the observation of phenomena, and then buttressed by reasoning on the basis of those phenomena.

In all his discussion of empirical observation and in the medical doctrine in which the use of hypothesis is illustrated, the author constantly betrays one of the surest signs of the scientific mind—a passion for exactness and accuracy. This is particularly notable in his insistence on the necessity of investigating the phenomena of each case individually and avoiding general, unqualified statements. Obviously, this demand for accuracy and exactness would be appropriate to and could derive from only an empiric, positivistic method of acquiring knowledge. A similar conciousness of the vital importance of accuracy is displayed also in the conception of measure (*metron*), as a factor in the treatment of the patient. In an earlier portion of the treatise,[23] the point is made that cures of illness cannot be accomplished on the basis of some simple principle. For diseases are highly complex, the author says, and they require great accuracy of method. It is necessary, therefore, for the doctor to aim at some measure. Unfortunately, no measure, either of number or of weight, is available, by reference to which real accuracy may be obtained. The only criterion is the "feeling" or "perception" (*aisthēsis*)[24] of the body. The physician's task is to acquire, by observation and experience, the most accurate knowledge. In this endeavor, although real exactness is rarely to be encountered, nevertheless the knowledge of some physicians is so accurate as to permit of only slight error. The recognition of the

[23] Chapter 9. The need of accuracy is also insisted upon in chapter 12.

[24] The word *aisthēsis* is a particularly difficult word to define in the medical writings of this period. Considering the medical doctrines of the treatise, I do not doubt that it means in this context the reaction of the *physis* to the "powers" (*dynameis*). Karl Deichgräber, *Hermes* 68 (1933), pp. 356 ff., thought that it should be emended to *diathesis*, a more technical word, but there is no evidence of a palaeographical nature for such a change. Against Deichgräber, *cf.* W. Müri, *Hermes* 71 (1936), pp. 467 ff.

restricted possibility of obtaining accuracy, because of the inescapable limitations of the times, is even stronger evidence of the author's scientific outlook than the consciousness of the need for accuracy, an attitude which is reflected at several other points in the author's discussion.

We must revert to the author's rejection of natural philosophy and its method and to the apparently egregious assertion of the supremacy of the medical *technē*. To repeat his words:

> In my opinion, all that has been written about Nature by natural philosophers has no more to do with medicine than with painting. I also think that certain knowledge concerning Nature can be derived from no other source than medicine, that Nature can be comprehended when medicine itself has all been correctly comprehended, but until then I am convinced that this knowledge is far from possible.

It would, of course, be only an evasion of the difficulty to attribute this statement to dogmatism or arrogance on the part of the author; besides, to do so obscures the logical conclusion of all that has been said concerning the conflict of the two rival methods. Nor does it resolve the problem to recall that natural philosophy itself had increasingly, as the cosmological approach to Nature had been gradually abandoned, attempted to comprehend the macrocosm by analogy to the microcosm, and to imagine that, after the fashion, perhaps, of Anaxagoras or Diogenes of Apollonia, the author is referring here to the microcosm-macrocosm analogy which in some schools had recently been so significant in the philosophic approach to Nature. Such a concept would seem to be quite alien to his mind. Rather, underlying the author's assertion is his comprehension (by no means commonplace at the time) of the relationship subsisting between man and Nature: the nature of man (*i.e.*, his organism, his *physis*) is a characteristic portion of the whole of Nature (*i.e.*, the *physis* of the whole, the universe). Man is an intrinsic part of Nature. Natural philosophy, because of the limitations of its method, can discover nothing certain and verifiable concerning Nature. But medicine, with its method of accurate observation and reasoning from the empirical data it thus obtains, does discover certain knowledge concerning Nature or, at least, of a limited portion of Nature. Hence, it follows that the only ap-

propriate approach to the understanding of Nature as a whole is through the *technē* of medicine; not through medicine narrowly conceived as a sum of rules of treatment of disease but through medicine conceived as a method. For, to the author, medicine is not the sum of certain rules of treatment but, as the treatise amply demonstrates, a method of acquiring exact knowledge concerning the *physis* of man. The principle on which he insists, therefore, is that all other aspects of Nature, as well as the *physis* of man, can be investigated and comprehended only by the use of the empirical, hypothetical method of his *technē*. More broadly speaking, he urges that the inductive procedures of "science" be extended to the investigation of all Nature.

THE EMERGENCE OF THE INDIAN IN MEXICAN IMAGINATIVE LITERATURE

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ANY person who examines the writings which record the history of Spanish America from the first days of the Spanish conquest to the first years of the twentieth century no doubt will be astonished no less than he will be depressed to discover how degraded has been the rôle of the Indian in the rise of the Spanish-speaking republics of the New World. Such emphatically will be his feelings if he examines that part of the historical record of Mexico which begins with the Crónicas of Hernán Cortés and of Bernal Díaz del Castillo and continues to our own day. To be sure, the ordinary Indian living in the country we know as Mexico had held from remote antiquity a lowly place in his social order. Before the coming of the *conquistadores,* the masses in this country, called by the Spaniards *Nueva España,* were shamefully exploited by the nobility of their own race. Consequently, the Spanish conquest could mean for these people, speaking generally, little more than an exchange of masters. After the conquest, as before it, their rôle was that of sustaining their oppressors by hard labor—labor more often than not performed under compulsion of one sort or another. For, whatever the philosophy of the Spanish conquest may have been, the Spanish conquerors saw to it that nowhere in the Spanish Indies was any impassioned plea of Dominican friars for Christian conduct so heeded, or any finely spun theory of Spanish justice so applied, as to deprive them of the fruits of Indian labor.

The motives of the *conquistadores,* indeed, pose for scholars today a difficult problem, a problem which can be understood only by one who knows the contradictions of sixteenth-century Spanish character. The conquerors of the Spanish Indies were men who could move quickly and easily from one pole to the other. In the morning their piety could prostrate them before the Cross, and in the evening their cruelty could rob the Cross of its meaning. Fran-

cisco Pizarro exemplified in extreme form the basest motive of the *conquistadores*—their lust for wealth; Bartolomé de las Casas exemplified in extraordinary degree the noblest motive of the conquest—the salvation of the Indians. Somewhere between these extremes no doubt the motives of most of the *conquistadores* may be found. The motives of these men were mixed—perhaps we might justly say that they were confused. On the one hand, the *conquistadores* appear to us as crusaders imbued with an almost fanatical zeal to spread their Holy Catholic faith throughout the enlarging possessions of their Castilian monarch; on the other hand, they appear to us as willful, brutal soldiers lusting after wealth and power. The blunt and honest Bernal Díaz blurted out much truth when he naïvely remarked that some of his companions in the conquest of the Aztecs "died in the service of God and of His Majesty . . . to give light to those who sat in darkness,—*and also to acquire that wealth which most men covet.*"[1] Bernal would not have been misunderstood by most Spaniards of his generation.

In Mexico, as also in Peru, the Spaniards conquered Indian peoples who were numerous, sedentary, and somewhat culturally advanced. Consequently, for these people the Spanish conquest meant a harsh subjugation rather than a cruel extermination. Under different conditions English conquerors in North America, like Spanish conquerors in Argentina, pushed aside the Indians they conquered so that the lands they acquired by their conquests could be occupied and exploited by Europeans. But in Mexico and in Peru the course of events from the time of the conquest onward necessarily ran otherwise. There a few conquerors superimposed themselves upon the people they had conquered. There the conquerors lived well because the conquered were made to work for them. There the conquest resembled that of the Normans in England, or that of the Romans centuries earlier in the Iberian peninsula. With much discernment an American historian, Edward G. Bourne, remarked nearly a half-century ago: "What Rome did for Spain, Spain in turn did for Spanish America."[2]

[1] Quoted by William H. Prescott, *History of the Conquest of Mexico* (New York, n.d.), II, 158.

[2] Quoted by Fernando de los Ríos, "The Action of Spain in America," *Concerning Latin American Culture*, Charles C. Griffin, ed. (New York, 1940), p. 77.

But, whereas the Romans did not force their culture upon the people they conquered in Spain, the Spaniards throughout their Indies endeavored more or less zealously to impose upon all the Indians they conquered their language, their religion, and, in general, their own way of life. In varying degrees they accomplished this purpose. They did even more than that. These conquerors freely mixed their blood with that of the people they conquered. But the Spaniards did not elevate the Indian to their own cultural level; under Spanish domination the Indian remained, and for long years after Spain had lost her Indies continued to be, the victim of harsh exploitation. Nevertheless, in the regions of dense Indian occupation and of advanced Indian culture the Indian withstood rather well the shock of the Spanish conquest, with the result that today several important countries of Spanish America, Mexico being one of them, are preponderantly Indian countries.

Almost from the beginning of the exploitation of the Indies by the Spaniards a dilemma was posed for the Spanish monarchs. By reason of the extraordinary powers—the *patronato real*—which they had acquired by papal grant to supervise the Church in the Indies, the Catholic Kings and their successors were obligated to protect the Indians and to convert and civilize them. But how could they discharge this duty—how could they maintain the status of the Indians as "free persons and vassals of the crown," and, at the same time, profit from the wealth of the Indies which could be obtained only by exploiting the labor of the Indians? Here was a problem which proved to be unsolvable. Yet the relationship between the Spaniards and the Indians must somehow be defined and legalized. Presently there emerged a shifty compromise, the result of attempts to reconcile the determination of the Spanish crown to do right by its Indian subjects oversea with the need for the crown to guarantee a supply of labor that would promote prosperity in the Indies. This pragmatic resolution of the dilemma resulted in an institution called the *encomienda,* a system of labor based upon the principle of patronage of Indians, a patronage conferred by royal favor upon *conquistadores* and other Spaniards in the Indies who deserved well of their king. Persons thus favored were called *encomenderos.* By the terms of their grant the *encomenderos* were obligated to protect the Indians thus "commended" to their care and to see to it that they received adequate religious

instruction. In return for these services, the *encomenderos* were authorized to exact labor or tribute from their Indians.[3]

Scarcely had the *encomienda* been legalized when the entire system of Indian labor that was evolving in the island of Hispaniola was savagely attacked. The man who there first dared to lift his voice in a plea for Christian justice for the Indians was a Dominican friar, Antonio de Montesinos, who in December, 1511, preached in a little church in Santo Domingo a sermon that left many a Spaniard gasping. "In order to make your sins against the Indians known to you," explained the aroused friar,

> I have come up on this pulpit, I who am a voice of Christ crying in the wilderness of this island. . . . This voice says that you are in mortal sin, that you live and die in it, for the cruelty and tyranny you use in dealing with these innocent people. Tell me, by what right or justice do you keep these Indians in such a cruel and horrible servitude? On what authority have you waged a detestable war against these people, who dwelt quietly and peacefully on their land? . . . Why do you keep them so oppressed and weary, not giving them enough to eat nor taking care of them in their illness? For with the excessive work you demand of them they fall ill and die, or rather you kill them with your desire to extract and acquire gold every day. And what care do you take that they should be instructed in religion? . . . Are these not men? Have they not rational souls? Are you not bound to love them as you

[3] The system of labor in the Spanish Indies has been treated briefly but with much learning by C. H. Haring in *The Spanish Empire in America* (New York, 1947), chap. 3. In the United States the foremost authority on the *encomienda* is Lesley Byrd Simpson, author of *The Encomienda in New Spain: Forced Native Labor in the Spanish Colonies, 1492-1550* (Berkeley, 1929) and of *Studies in the Administration of the Indians in New Spain*: III. *The Repartimiento System of Native Labor in New Spain and Guatemala* (Berkeley, 1938). Recently another American scholar, Lewis Hanke, has dealt extensively with this subject in his *The Spanish Struggle for Justice in the Conquest of America* (Philadelphia, 1949). This book in Spanish translation will be brought out in Buenos Aires under the title of *La lucha por justicia en la conquista de América*. A contemporary Mexican historian, Silvio Zavala, has specialized in the history of the system of labor in the Spanish Indies, giving particular attention to the operation of that system in New Spain. See his *La filosofía política en la conquista de América* (Mexico, 1947) and his *New Viewpoints on the Spanish Colonization of America* (Philadelphia, 1943). A list of Zavala's writings appears on page 118 of the last-named work. For additional works on the subject of the system of labor in the Spanish Indies, see Haring, *op. cit.*, pp. 360-362.

> love yourselves? . . . Be certain that, in such a state as this, you can no more be saved than the Moors or Turks.[4]

The "cry for justice" thus raised, needless to say, was soon heard in Old Spain, and nowhere more loudly than in the court of the Catholic King Ferdinand. Out of the commotion thus aroused there emerged, as early as 1512, laws embodying reforms —the famed laws of Burgos. Although these laws did not abolish the *encomienda,* they did lay down principles intended to insure the humane administration of the Spanish colonial system of labor. But the "cry" in Hispaniola had even more far-reaching results. It precipitated a great debate in the Spanish Empire, a debate which produced a searching of hearts in the Spanish Indies as well as in Old Spain; it set on foot a vigorous movement for reformation, a *lucha por justicia en la conquista de América;* and it raised up one of the greatest propagandists of all times, the Dominican friar Bartolomé de las Casas, a man whose long-continued labors in the cause of justice for the Indians in Spanish America won for him the title of "Protector of the Indians."[5] Nevertheless, the cause of the Indians proved to be a lost cause. Despite the labors of Las Casas, the lot of the Indians was little ameliorated; despite the New Laws of 1542 which would have done away with the *encomienda,* this system long persisted. Again and again laws made in Spain for the protection of the Indians

[4] Quoted by Lewis Hanke, *op. cit.,* p. 17.

[5] Prescott, *op. cit.,* I, 258. Fray Bartolomé de las Casas, who is known as the most persistent and the most tireless of the defenders of the Indians, was born in Seville in 1474. While a student at Salamanca University, he had an Indian slave whom his father had brought to Spain from the New World. In 1498 Las Casas completed his studies in law and in divinity at Salamanca, and four years later he went to the *Isla Española* (Santo Domingo). There for eight years he cultivated the soil, using Indian slaves as laborers. Deeply moved by Montesinos' sermon, he presently realized that he had committed a moral error in profiting by the labor of these slaves. In 1810 he had been admitted to the priesthood, and the next year he went to Cuba, where, after another brief period of exploiting Indian labor for his own gain, he turned his attention wholeheartedly to the task of righting the wrong that he and others had done to the Indians. He made many trips to Spain to plead the cause of the Indians. Largely because of his efforts, *Las Leyes Nuevas* were passed in 1542. These laws, *inter alia,* were supposed to terminate Indian slavery in Spanish America. Unfortunately, they were not given full effect in the Indies, with the result that the Spaniards in the New World continued to exploit Indian labor pretty much as they pleased. Las Casas, however, kept up his fight for the Indians until his death in 1566. In 1522 he had joined the Dominicans. He has become known to posterity as "The Apostle of the Indies."

were not given effect in the Indies. Unable to solve the dilemma confronting them, the Spanish monarchs took away from the Indians with the left hand what they gave them with the right hand. Throughout the entire colonial period the great majority of the Indians in Spanish America experienced little if any freedom. Some of them were held in slavery, and many more of them were held in a state of unfreedom just short of slavery. Even the practical disappearance of the *encomienda* system toward the end of the eigtheenth century meant little if any improvement in the lot of the Indians. The story of the long-continued degradation of the Indian by Spanish authority is as depressing as it is fascinating; but here, unfortunately, there is not space to tell that story *in toto*.

Just as the Indian in Mexico and elsewhere in America was long deprived of his inherent economic and political rights, so was he long denied his rightful place in Mexican and other American literature. Perhaps it was because of his lowly economic and social status that he remained culturally unnoticed. Whatever the reason may have been, colonial writers and artists in New Spain found nothing to interest them either in the Indian himself or in his colorful pre-Columbian culture. These writers and artists were in New Spain, but not of it; they derived their cultural inspiration from overseas. Even after the separation of New Spain from Old Spain in 1821, the colonial régime lived on in Mexico. Once again the Indian had experienced a change of rulers, but not a change of condition. After political independence had been achieved, cultural patriotism developed very slowly in Mexico, much more slowly, indeed, than in the United States. In the years immediately following their political emancipation from Spain, the Mexicans had no Noah Websters, no Jedidiah Morses, and no counterparts of other early cultural patriots of the United States. In Mexico colonial-mindedness persisted through the nineteenth century, and the Mexican novelists and artists of that time ignored the Indian, though he was an obvious subject for pen as well as for brush. The twentieth century, however, has seen a significant change. In recent decades Spanish America has moved rapidly along the road to literary independence, and one of the significant expressions of this new development is the growing interest of Spanish American novelists and artists in the American Indian. In Mexico this interest has laid hold of the upper classes to a remarkable degree.

There, it seems, the Indian at long last is in the way of coming into his rightful heritage. My principal concern in this paper is to show how the Mexican Indian, after being exploited and despised for centuries, has in recent years become an object of much interest to prominent Mexican writers of imaginative literature. More particularly, my concern is to show how this new interest in the Indian has manifested itself in the writings of Gregorio López y Fuentes and of others of his generation.

Mexican literature in the beginning consisted of descriptions of the country as the Spaniards found it and of recitals of the brave deeds of *conquistadores*. Cortés in his letters to his monarch, Emperor Charles V, wrote the first vivid description of New Spain. Naturally Cortés so related the story of the conquest of the Aztecs as to give his emperor and other persons the impression that the conquest was principally due to the skill which Cortés had displayed in planning campaigns and in leading his men. The unfairness of Cortés' account and the gross exaggerations in the history of the conquest subsequently written by Francisco López de Gómara (1511-1557), chaplain in Cortés' household, so aroused Bernal Díaz del Castillo (1492-1581), one of the *conquistadores*, that in his old age he set himself the task of writing the "true" history of this great event. Thereby he would do justice to himself and to the other forgotten heroes by letting the world know that Cortés was never "alone" in the land of the Aztecs, and that the conquest of New Spain was achieved for the Catholic Church and the Catholic king as much by hardy and valorous soldiers like Bernal Díaz as by the tactical skill of Cortés supplemented perhaps by the flattery Cortés may have received from his Indian mistress, the Princess Marina. The result of Díaz's determination to set the record right was the delightful *Historia verdadera de la conquista de Nueva España*,[6] a work of art as well as a chronicle of history. Díaz was a true soldier-artist, the peer, if you please, of Julius Caesar. Not only did he describe the Aztecs and their customs as he saw them; not only did he describe the country he helped to conquer; not only did he give a detailed account of the

[6] Bernal Díaz del Castillo, *Historia verdadera de la conquista de la Nueva España*. 3 v. (Mexico, 1891-92), I, xi-xii. This book in English translation has appeared in numerous editions. A reprint of an English edition of 1800 was brought out in New York as late as 1927 by Robert M. McBride and Company.

conquest itself; but, like Caesar, he did not minimize his own accomplishments. When chided for praising himself instead of leaving this task to others, he was not at a loss for an answer. "Who else could praise him and his fellow conquistadores?" "Who else besides the birds and the clouds had seen what they had done?" In truth, Díaz insisted, his fault consisted in not praising himself enough. He had fought many more battles than had Julius Caesar![7] Moreover, when taken to task for assuming, fifty years after the event, to recite the names of all his companions in the conquest of the Aztecs he was again ready with a convincing answer. "Why should he not recollect the names of 550 companions who were always together in skirmishes, in battles, and in watches, and who were constantly conversing with one another about what had happened to this one and that one?"[8] Thus he disposed of scoffers, and by his "true" recital of the history of the Great Conquest he put in their proper places Francisco López de Gómara and other liars. *Historia verdadera de la conquista de Nueva España,* thanks to the story it tells and to the man who told it, ranks as the oldest classic of Mexican literature.

If Bernal Díaz was the chronologist for the Spanish soldier, Fray Bartolomé de las Casas (1474-1566) was emphatically the historian of the Spanish missionaries. Las Casas, as we have noted, became greatly interested in the sad plight of the Indians, and exerted all his talents and all his influence to bring about reforms which would ameliorate their condition. His writings, therefore, were controversial rather than factual; but his *Historia de las Indias* was more than a tract for the times. To that work we are indebted for a better knowledge than we otherwise would possess of the Indians and the country of Mexico at the time of the conquest.

From the Crónicas we pass on to the first works of Mexican writers which, as judged by Spanish standards, have literary merit. It is truly remarkable that the writings of two creoles of New Spain, Juan Ruíz de Alarcón y Mendoza (1581?-1639) and Sor Juana Inés de la Cruz (1651-95), should be considered good enough to be noticed in all the histories of Spanish literature. No writers of the English colonies in North America have received

[7] *Ibid.*, III, 438-439.
[8] *Ibid.*, III, 407.

comparable attention in the histories of English literature. The reason, no doubt, for this difference is that Spanish culture in Mexico is older by nearly a century than is English culture in the United States. Whereas printing began in New Spain before 1540, printing in New England was scarcely started by 1640; and, whereas the University of Mexico, patterned after the University of Salamanca, had opened its doors to students as early as 1553, Harvard College, a child of the University of Cambridge, did not celebrate its first commencement until 1642. Thus before the middle of the sixteenth century the printing press and the university had given an impetus to literary efforts in New Spain.

The changing cultural climate of New Spain nourished, during the last two decades of the sixteenth century, a physically deformed youth who was destined to bring great fame to his native land. Juan Ruíz de Alarcón, a hunchback, was born of Spanish parents in Mexico City, and in that city he lived until he was twenty years old. He then went to Spain and took a degree at the University of Salamanca. Later, returning to Mexico City, he received a degree in law from the University of Mexico in 1608. But fame and fortune he could not achieve in his own country. Consequently he returned to Spain, there to compete with distinguished writers such as Miguel de Cervantes, Lope de Vega, Tirso de Molina, and many others. He struggled long and hard for recognition. Because he was born a creole, Peninsular Spaniards long denied him the distinction he merited. In Spain he lived and died as *el indiano;* but today Spanish literature accords this Spanish creole the glory and the honor he longed for in his lifetime. Now he is acclaimed as an outstanding Spanish author of the *Siglo de Oro,* a man of letters whose genius was felt in France. Corneille freely acknowledged that Juan Ruíz de Alarcón's drama, *La verdad sospechosa,* had inspired his *Le Menteur,* and Molière in turn is said to have been inspired by Corneille's work based on *La verdad sospechosa.* A modern critic, Carlos Castillo, in his *Antología de la literatura mexicana,* thus sums up Ruíz de Alarcón's claim to fame:

> Ruíz de Alarcón is the most frugal and moderate of the four outstanding dramatists of the *Siglo de Oro.* He is less fertile, less versatile than Lope de Vega, and less lyrical than Calderón de la Barca; but he is the most precise, the most modern, the most reflective; and he is less

> like Góngora. His influence in the theatre of Corneille and Molière is evident and admitted. But what is often not pointed out is that this American dramatist is the creator of the thesis drama which was to be very popular in the nineteenth-century France of Alexandre Dumas.[9]

The fact that the Spaniards claim Ruíz de Alarcón as one of their own writers reveals that in spirit he was Spanish rather than American. Had his own country been prepared to give him what he craved, he might well have become the first great Mexican author.

Another Mexican colonial writer whose fame is equal to that of Juan Ruíz de Alarcón is Sor Juana Inés de la Cruz. This world-renowned nun was born Juana Inés de Asbaje. So precocious was she that at the age of three she could read and write. Because of her charm and beauty, this young girl became a lady in waiting at the court of the viceroy, where she was greatly admired by the noblemen. By the time she was sixteen, however, she had so tired of court life that she determined to give herself to the service of others as a nun at the Convent of Santa Teresa. Life at this convent, however, was so confined and so strict that her health gave way, and for two years she was unable to carry on her labors. But in 1669 we find her again at work in the Convent of San Jerónimo. Here she wrote some of the most beautiful poetry in the Spanish language. Perhaps justly she has been called both the "Fénix de Mexico" and the "Tenth Muse."[10] In her literary endeavors she was greatly influenced by the two Spanish masters of her day, Calderón de la Barca and Luis de Góngora. Thus in spirit she became Spanish. Unlike Ruíz de Alarcón, she lived her whole life in America; but, like him, she was not of America. Her contributions were to Spanish literature, not to Mexican literature.

[9] Carlos Castillo, ed., *Antología de la literatura mexicana* (Chicago, 1944), p. 40. The translation above is the writer's. The Spanish text follows:

"Ruíz de Alarcón es el más parco y sobrio de los cuatro grandes dramaturgos del *Siglo de Oro*. Es menos fecundo y versátil que Lope de Vega y de menos lírico arrebato que Calderón de la Barca; pero es más preciso, el más moderno, el más reflexivo, el menos gongorista. Su influencia en el teatro de Corneille y Molière es evidente y admitida. Pero lo que a menudo se deja de decir es que este dramaturgo americano es el creador de la comedia de tesis que tanta boga había de disfrutar en el siglo XIX de la Francia de Alexandre Dumas."

[10] Arturo Torres-Ríoseco, *The Epic of Latin American Literature* (New York, 1942), p. 34.

She was famous in Spain long before her worth was recognized in her native land.

If Ruíz de Alarcón and Sor Juana Inés de la Cruz felt impelled to follow European trends in literature, they were not peculiar. Other Mexican colonial writers also believed that their country was inadequate, too uncouth to have a literature worthy of the name. Foremost among these was Carlos Sigüenza y Góngora (1645-1700), whose literary work, *Los infortunios de Alonso Ramírez,* recalls the Spanish picaresque novel best exemplified by *Lazarillo de Tormes.* Even in his poem, *Primavera indiana,* we find Carlos Sigüenza y Góngora living up to the tradition set by his ancestor, Luis de Góngora.[11]

Because the leading writers of colonial Mexico could not get rid of their inferiority complex, the Mexican Indian acquired no place in Mexican colonial literature. The allurement of a distant land and of a distant culture was more attractive to them than was the wealth of material at their doorstep. Here was the Indian with his centuries-old culture, with his colorful costumes and his picturesque customs, suggesting fresh and rewarding subjects for writers. Yet the Indian was neglected because the creole considered himself superior to the Indian and inferior to the Spaniard overseas. So it fell out that the colonial period of Mexican literature was one of imitation of Spanish literary trends and of Spanish masters.

Nor was the Indian destined soon to find a place in the literature of an independent Mexico, despite the fact that he played a greater part in the effort to emancipate his country from Spanish domination than Indians in South America played in similar efforts to emancipate their countries. The movement for Spanish American independence, indeed, affords an interesting study in contrasts. For the most part the leaders of the South American republics

> were creole gentlemen such as Miranda, Bolívar, and San Martín. These men had been touched by the spark of European Enlightenment and the ideals of England and Revolutionary France. The abuses against which they struck were primarily political, rather than social. The leaders of South American independence assailed Spain's discrimination against American-born white settlers, but

[11] Alfred Coester, *The Literary History of Spanish America* (New York, 1938), p. 25.

> were mute concerning the plight of the Indians. By contrast, the leaders of Mexico's revolutionary struggle were two parish priests, Hidalgo and Morelos; their captains were Indian and mestizo warriors, such as Vicente Guerrero; their armies were awakened peons of the latifundia.[12]

Nevertheless, despite such participation in the effort for Mexican independence, the Mexican Indian gained nothing from independence. The whites acquired and long retained full political and economic control of the country. Against the harsh treatment inflicted upon them, Mexican Indians again and again rose in revolt. These rebellions invariably were against "the exaction of onerous tribute, the absorption of the communal lands of the villages, and the bondage of the hacienda."[13]

After Mexico had gained her independence there was much political unrest in the country. In 1823 Agustín Iturbide by a *coup d'état* was able to have himself declared emperor of the Mexican Empire. But the republicans and the army rose against him, forced him to abdicate, and in 1824, by order of a Tamaulipas court, had him shot. A republic was then declared, but, because they could not agree on the kind of government they desired, Mexicans continued to live in a state of political chaos. In 1863 the French invaded Mexico and in 1864 proclaimed Ferdinand Joseph Maximilian emperor of that country. But Maximilian never won the support of the Mexican people. Benito Juárez, the gifted Indian patriot, maintained an armed opposition, and in 1867, after the French army had been withdrawn from Mexico, overthrew the empire. Soon thereafter Maximilian was shot.

These troubled times are accurately reflected in Mexican writings of that period. Because the Mexican people failed to achieve national unity, the sentiment of nationalism did not develop in Mexico. The Mexican writers of this period continued to follow faithfully the Spanish masters. Most compilers of anthologies of Mexican literature put in one group all their selections from Mexican writings between the years 1821 and 1867, thus making a literary period coincide roughly with a political period—that of Antonio López de Santa Anna and of Benito Juárez. The best known writers of this period are José Joaquín Fernández de Lizardi

[12] Nathaniel Weyl, "Mexico, European and Native," *Concerning Latin American Culture*, p. 134.
[13] *Ibid.*, p. 136.

(1776-1827),[14] author of *El periquillo Sarniento,* a picaresque novel like that of Carlos de Sigüenza y Góngora, his Mexican predecessor who had used *Lazarillo de Tormes* as his model; Manuel Eduardo de Gorotiza (1789-1851),[15] who belongs to the Spanish neoclassical school of Leandro Fernández de Moratín; and José María Roa Barcena (1827-1908),[16] who is best remembered for his Mexican legends written in verse. Barcena was highly praised for his style by Juan Valera, the Spanish critic and novelist. In the writings of none of these men, however, does the Mexican Indian receive any notice.

The period extending from 1867 to 1910 was the period of Romanticism in Mexican literature. Politically, these years cover the latter part of the life of Juárez and the entire dictatorship of Porfirio Díaz. Because of his theory of economic liberalism, Juárez inadvertently dealt a heavy blow to the Indian communal land system. In his eagerness to establish an agrarian middle class he tried to transform the commons into small Indian peasant properties. This reform was met by stubborn resistance. During Díaz's regime large areas of land were acquired by individuals and by foreign companies for very nominal sums. Thus the Mexican Indian was once again subjected to a heavy bondage, and Mexican unity was not achieved in the age of Díaz. The period in which Juárez was attempting to bring about reforms produced many romanticists and writers, among whom Ignacio Manuel Altamirano (1834-93) is outstanding.[17] This Indian prose writer is said to have lived in an almost savage state until he was fourteen years of age. He then went to school and learned the Spanish language. He later received a law degree from San Juan de Letrán College in Mexico City. His best known works are *Clemencia, El Zarco,* and *La Navidad en las Montañas*. The last two works are excellent for their descriptions of the country and its customs. The themes, however, are not purely Indian. Altamirano is best known for his "cuadros de costumbres," a series of descriptions of customs and of scenery which vividly call to mind the works of the famous Spanish writer of the nineteenth century, José María de Pereda (1833-1906). Altamirano seems, however, to have been the first writer of note to observe that his

[14] Castillo, *op. cit.*, p. 121.
[15] *Ibid.*, p. 138.
[16] *Ibid.*, p. 179.
[17] *Ibid.*, p. 210.

country and its people were worthy subjects of literature. Perhaps in his writings we can discover the beginning of truly nationalistic sentiment in Mexican literature.

From this time onward we observe Mexican men of letters becoming deeply interested in their own countrymen, not as people enchained by Spanish culture but as a new nation rising from a vast Indian and *mestizo* population, finding many of its leaders among both Indians and *mestizos,* and acquiring a sense of national unity. This transformation, however, was not effected in a day. It was the culmination of a long development. In the early part of the nineteenth century the Mexican people passed through a difficult period of transition. The *mestizo* wanted to be free of Spanish domination, but at the same time he could not find it in his heart to accept the Indian as his equal. The Mexicans, therefore, found themselves in the anomalous situation of being politically free and yet of not possessing that freedom which they thought they would enjoy by throwing off the Spanish yoke. In this time of spiritual malaise they turned to France for inspiration.[18] It became the vogue for Mexicans to be educated in France. Toward the end of the nineteenth century the naturalism of Zola became popular in Mexico, and Mexicans more and more came to believe that by imitating the French they were severing their ties with Spanish romanticism. The fallacy in this kind of reasoning was that they were still not masters of themselves. The cultural revolution had to wait until the political revolution had been fully achieved.

The Revolution of 1910 undoubtedly marks the beginning of a new era in Mexican history, for this revolution was a social no less than a political convulsion. As F. Rand Morton so aptly expresses it,

> The Revolution can be said to be a longing for the liberty of every man, liberty to express himself, liberty from tyranny, be it political, economic, or cultural. It is, moreover, faith in oneself to secure that liberty. In short, the result of the Revolution is the will to live, to think and create like a Mexican; to express oneself, above all, in the field of literature in accord with one's convictions.[19]

[18] *Ibid.*, p. 21.

[19] F. Rand Morton, *Los novelistas de la revolutión mexicana* (Mexico, 1949), p. 17. The translation above is the writer's. The Spanish text follows: "La Revolución, como se entiende aquí, es un deseo por la libertad per-

After the Revolution of 1910 men like Diego Rivera and José Clemente Orozco began to discover native subjects and to depict them on canvases and on murals. Thus they gave the world a pictorial history of the era of Pancho Villa, Carranza, Zapata, and the rest of those colorful rebels. Other aspects of Mexican culture were similarly affected. For example, Carlos Chávez, the famous Mexican composer, believes that the Revolution of 1910 was one of the positive forces in modern music.[20] This new era of freedom increasingly has been dominated by men of action who also have been men of letters. José Vasconcelos (1881-), José Rubén Romero (1890-),[21] Alfonso Reyes (1889-),[22] and Gregorio López y Fuentes (1897-),[23] to mention but a few of them, are men who have served their country well. They have been keenly aware of the plight of the submerged masses of Mexico, and they have done much to lessen the burden of the peon. Vasconcelos was in Washington, D. C., when the Revolution of 1910 broke out in Mexico, and from that city he served his fellow countrymen as mentor. Here he was able to make contacts which furthered the cause of the revolutionists, a cause to which he was wholeheartedly devoted. Although he refused a political office at the close of the revolution, he gladly accepted the post of Director of the National University in 1920. While holding this office he was able to attract the most distinguished scholars in Mexico, and he also was able to effect changes in the curriculum, the result of which was to raise the standards of this institution to the level of those at leading universities throughout the world. Today Vasconcelos is best known as a philosopher and as one of the leading exponents of modern Latin-American thought. José Rubén Romero has held many political posts abroad and in that way has been able to make known to many the new trends in his country. Alfonso Reyes also has held diplomatic posts abroad. His essays are famed for their admirable

sonal de cada hombre, libertad para expresarse, libertad de cualquier tiranía, ya sea política, económica o cultural. Es, además, la fe en su propio valor para obtener esa libertad.

"Así, pues, el resultado de la Revolución es, en una palabra, el valor para vivir, pensar y crear como mexicano; expresarse, sobre todo en lo que se refiere a la literatura, de acuerdo con su propia voluntad."

[20] *Ibid.*, p. 22.

[21] *Ibid.*, pp. 71, 184.

[22] Castillo, *op. cit.*, p. 387.

[23] Henry A. Holmes and Walter A. Bara, eds., *Tierra* (New York, 1949), p. xxiv.

prose. His poetic works, although few in number, are varied in form and theme. His style is eclectic, and therefore he belongs neither with the classical nor with the ultra-modern authors.

Of the more recent Mexican writers, Ermilo Abreu Gómez, Julio Rueda Jiménez, and Arturo Torres-Rioseco have been influential in bringing about many national reforms. Through their newspaper articles, their participation in national as well as in international conferences, and their lectures at leading universities, they have promoted popular education. Many others have supported movements to improve the condition of the Indian—movements to restore to him his land and to teach him better methods of tillage and the latest knowledge of nutrition and of sanitation. They have done much to persuade the untutored Indian that the heavy yoke of his white countrymen and of foreign capitalists should no longer be his burden. For centuries the Mexican Indian was under the domination of Spaniards, and during the regime of Porfirio Díaz was shamefully exploited by foreign capitalists. Little wonder, then, that he became afraid of every white man! The patriotic and enlightened men just mentioned have labored also to awaken their educated fellow countrymen to a realization of the social and economic ills of their country. Mariano Azuela (1873-)[24] in his novel, *Los de abajo* (1916), which has been published in English translation under the title of *The Under Dogs,* showed the world that he was fully aware of the social distresses of Mexico. Federico Gamboa (1864-1939)[25] was also greatly preoccupied with the social and moral problems of his day. His novel *La Llaga,* published in 1910, entitles him to a place among the contemporary Mexican writers.

Though the writers just mentioned have achieved renown in Mexico, their fame is certainly no greater than that of Gregorio López y Fuentes (1897-). The great distinction López y Fuentes enjoys in Mexico today is no doubt due in part to his career as a journalist and in part to the fact that his greatest novel, *El indio,* has been ably translated and well received in foreign countries. This writer's sympathies for the Mexican Indian are as broad as they are deep. One of his primary interests is "la tierra," or, more specifically, the "ejidos," the communal lands of the Aztec

[24] Morton, *op. cit.,* p. 29.
[25] Castillo, *op. cit.,* p. 364.

forefathers of the Mexican peasants. To understand the Revolution of 1910 one must comprehend the great hunger of the Mexican peasant for land. This longing of his comes from the long ago when his forefathers had communal lands which they tilled; and, although the Aztec noblemen took most of what these lands produced, the Indian laborer, nevertheless, had a certain sense of proprietorship. After the conquest these communal lands were laid hold of by the *conquistadores,* and the Indians who were thus dispossessed were "commended" to the Spaniards.

López y Fuentes' novel *Tierra* (1932), which is concerned with a succession of incidents in the lives of the Mexican peasants during the Revolution of 1910, clearly reveals this longing of the Indian to regain the land which his ancestors called their own.[26] The Mexican Indian cannot endure the *mayordomo* who whips him as though he were a dog. He burns to avenge himself against the *hacendado* who sells food to his workers at exorbitant prices. Often the *hacendado* has a general store from which he compels his peons to buy what they need at prices higher than those charged in general markets. At the *hacendado's* store prices are so high that families compelled to pay them are kept in debt to the *hacendado* from generation to generation. Such is the reward of the peons for their arduous labor of tilling their master's land. One need not wonder, therefore, that the braver and more venturous of them should have deserted the land to join the leaders of the Revolution. Little did it matter under whose banner they fought, provided that there was hope of their gaining something; and, even if they did not win, they had nothing to lose.

In *Tierra,* López y Fuentes gives us a moving picture of the life led by these hard-working peasants and their families. After a week's labor in the sugar mill, the peon stops at the owner's store to buy a pair of shoes or a few yards of goods for his wife, and the *hacendado* records the purchase in his ledger. After the transaction is completed, the peon knows he has been duped, but he doesn't know what to do. Puzzled, he asks for an explanation, and the storekeeper answers, "I charge you a dollar, and that's one dollar you owe me; one dollar I mark down; two dollars and one dollar make three dollars, *sabe?*" The peon widens his eyes as if to see better; he scratches his head; and then he gives up in despair. All the

[26] *Tierra,* p. ix.

workers of the *hacendado* are treated in much the same way. They have nothing to look forward to. Often a worker tries to run away from his inherited debt, for he knows that he will never be able to pay it. His freedom is short-lived, however, for the *hacendado* resorts to every device short of using bloodhounds to find him, and more likely than not he is brought back with his arms bound as if he were a criminal.

Thus we understand why a few brave souls leave in the dark of the night and join the forces of the notorious Pancho Villa, or those of Emiliano Zapata, or the army of Francisco Madero, the man who has been increasing his own power because the aging president, Porfirio Díaz, has been relaxing the iron grip with which he has held Mexico for some forty years. Whole villages are deserted; ranches are used as headquarters for the fighting factions; and the *hacendados* retreat to the mountains or to some other safe hideaway. Finally, the year 1920 arrives; most of the leaders have been killed, at least so the gossips say. The story of the killing of the leaders has many times been told, and the simple-minded folk, yearning for peace, are eager to believe it. These peasants are not truly interested in fighting; they are interested only in getting a little land which they can till and thus become self-sustaining so that they can hold their heads high and be proud that they are descended from the Aztecs.

The work of López y Fuentes seems to prove that his apprenticeship on the staff of *El Universal,* one of the leading newspapers of Mexico City, has been an invaluable one. Although at the age of twelve he began writing stories for magazines such as *Nosotros* and *El maestro,* he continued his formal education, and in time he became a professor of literature in the Normal School of Mexico City. Since 1921 he has been connected with *El Universal,* and today he is its director. While gathering material for a column called "The Daily Story out of Real Life," he no doubt acquired a wealth of information on which he has drawn freely to depict every type of person found in his works.

After *Tierra,* López y Fuentes brought out in rapid succession several works similar in character to his first one. Of these, *Mi general* (1934) is a good example. In 1935 he published *El indio,* a book which established his reputation as an author. This book was awarded the first Mexican National Prize in Literature in 1935.

Translated into English by Anita Brenner, it was published in the United States under the title of *The Indian* and in England under the title of *They that Reap.*[27]

El indio deals with the life of an isolated Indian village the inhabitants of which for centuries have tilled the soil and have lived in the same huts generation after generation. Presently the routine of life in this village is disturbed by the arrival of three white men in search of gold. The Indians say that they do not know where gold can be found, but the white men are insistent, and after much persuasion the Indians permit one of their young men to accompany them on a trip, presumably to search for herbs. Soon, however, the Indian scout realizes that these white men are looking for gold. Because he cannot lead them to such treasure, they bind him and threaten to hang him. But, even though he is bound, he escapes, and plunges down a rough mountainside, falling so near to his village that he is found by friends who take him to his home. The whole village is incensed by this act of brutality, the second of its kind, for on the morning that the party set out on the supposed search for herbs one of the white men had tried to seduce an Indian girl who was bathing in the river. Thoroughly frightened, the villagers consult among themselves, and presently, accepting the advice of their elderly men, they put their meager possessions on their backs and withdraw to mountain hideouts.

In the meantime, the three white men having reported that these Indians were hostile, an armed party has been sent to punish them. The members of this expedition, consisting of a few policemen, a few adventurers, the teacher in the district *pueblo,* and the secretary of the mayor of the *pueblo,* approach the Indian village. Disturbed by the silence of the village, they dismount, and with guns in hand advance cautiously. Convinced at last that the village is deserted, they set fire to a hut or two and then assemble to discuss the problem confronting them. What should be done with these Indians? One of the men suggests that they should be killed, as Indians elsewhere had been killed by their conquerors. Many other opinions are offered before the teacher proposes two possible solutions of the problem. One of these is the crossing of the Indian with the white, the result of which might well be the emergence of a race superior to that of the Indian or to that of the white man. The

[27] *Ibid.*, p. xxv.

other one is to educate the Indian and thus emancipate him from his superstitions and his illiteracy. These proposals are not well received, for some of the men taking part in the discussion, despite the fact that they themselves are *mestizos,* are not disposed to be realistic. Consequently, the discussion leads nowhere.

Meanwhile, in their mountain hide-out the Indians are enduring great hardships. Finally the *hacendado,* much distressed by their sufferings, persuades them to return to their homes. The arguments he makes to them are indeed moving ones. He has lost much trade because of their absence; the fields have lain untilled; the village is overgrown with weeds and vines. For the good of the community, therefore, the Indians should return. They should think of the public welfare, a part of which consists in the *hacendado's* profiting from their work. Thus are the Indians persuaded to leave the mountains in order to resume their labors for the benevolent *hacendado.* After their return they hear one night the firing of many guns, and they are ordered to pack up and return to their mountain stronghold. Like so many ants, they line up and then silently steal away. When the fighting has ceased, they return. Thus their life flows on. Revolutionary factions come and go, and the villagers preserve themselves as a community by retiring from their homes when danger threatens. When the last bullet is fired and the fighting is over, they return to their tasks just as their fathers had done before them.

Like warfare, in *El indio* epidemics also come and go, leaving as their only mark fresh graves in the village cemetery. All the misfortunes which befall these Indians—revolutions, floods, pestilences, and other calamites—leave them more stoical than before, but do not alter their routine of living. The council of old men continues to decide all questions of importance to the individual and to the community. The only signs of change are, first, orders issued by the priest to build a church, and, later, decrees issued by the government to build a school. These orders the villagers receive and carry out with no sign of enthusiasm, for as yet they have perceived no lightening of their burden. To be sure, land has been given to a few, but such gifts have helped them little, for they have no tools and no seed. So they continue to work for the *hacendado* as they have done before. The school teacher who comes among them

perceives that their social system will have to be changed before he can teach them to read and write.[28]

Such, then, is the Indian problem of Mexico today. Long degraded and long oppressed by white men, the Mexican Indian has come to feel that all hands are raised against him. Even of those who sincerely pity him and would aid him, he is deeply suspicious. White men, he reasons, cannot wish him well. Even the *mestizos*, he feels, are not of his race. Social reform in Mexico, therefore, rests upon the solution of a two-fold problem: that of persuading the white people to believe that the Indian is worth saving and that of so transforming the mind of the Indian that he will be eager to be socially saved. This centuries-old problem of Mexico will not be quickly or easily solved. But the fact that the Mexican Indian at last has become a central theme of contemporary Mexican literature—that he has won the sympathy of the ablest Mexican men of letters—is an omen of glad tidings. The emergence of the Mexican Indian in Mexican imaginative literature may well be the prelude to the emergence of the Mexican Indian as a useful and an honored member of Mexican society.

[28] Gregorio López y Fuentes, *El indio* (Mexico, 1937).